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E K I S T I C S

HOUSING & PLANNING ABSTRACTS

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Dymaxion map on cover by Buckminster Fuller, Patent 2393676

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EDITORIAL

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People working in the field of housing and planning face every day problems which cut across time and permeate through the mores of the society in which they operate. Such problems are reflected to some degree in the range of abstracts included in this issue of Ekistics.

Housing

There is often much to be learned from the earliest developments of shelter by man in various parts of the earth. Traditionally developed housing is seldom uniform even under identical climatic conditions. This is evidenced by two examples of traditional housing from the Indonesian island complex of Sumba, where two distinct types of houses have evolved. In the next issue of Ekistics, an abstract will be included on the traditional housing of the neighboring island of Bali which has developed quite differently.

Some of the best present day efforts to achieve solutions to the housing problem borrow from traditional housing its basic principles of functional efficiency. This can be seen in this issue in the development of a model farm in Italy as well as in the highly urban housing developments of Israel. But the more organized the society, the greater the complexities of the economics of housing, and a good examples of this is our continuation of the summary of cost comparisons for flats and houses in Great Britain.

Planning

If planners are to perform their function of acting in the public interest, they must work for the solution of problems for all groups in the society. A striking example of one often overlooked is that of the Tokyo ragpickers, who brought their needs to the attention of technicians mainly through their own success in planning their "Ant Town." In this case their technical assistance came from students of the school of architecture in Washeda University.

Ekistics has tried to report on every "new town" that comes to its attention. This month the new industrial town of Nangal is described, based upon power derived from the great new Bhakra dam in the north of India, which was mentioned in the November issue of Ekistics. The degree to which the design for this new city is derived from Le Corbusier's plan for Chandigarh is very marked, and reflects the esteem with which the Indians regard this pioneer city. Next month a very different outline plan will be presented: the plan for the steel city of Rourkela designed by the German firm of Krupps.

New cities are, however, rarities in the planning field and a good instance of planning with the existing elements is that of the pilot-plan for Tunja. Here a team of architects and planners planned for the revitalization of an historic regional center with reference to its strategic location between two modern industrial centers, thus building a bridge between the often separated fields of urban planning and regional planning.

Regional planning itself must span the gap between national economic planning for a developing country and the physical design of local communities. Such planning may also be referred to as resources planning, and just this side of the process had received attention recently in India. Chatterjee has provided planners with a valuable summary of natural resources ad physico-economic bases for regional planning. And Prasad has stressed the need for conservation

of resources, along with the more efficient planned use of them.

In the construction section we present this time two articles prepared by the Ideas and Method Exchange. The first of these has to do with the development of the modular measure as a technique in construction. The second is a sound description of the basics of concrete, as well as instruction of the use of this material.

In more general articles, the description of bullock-generated electric power for villages in India may well mark a new revolution in village life. Equally worthwhile are the efforts to systematize cartographic work in the world, and especially in underdeveloped parts of Asia.

Appendix.

For the third time Ekistics brings its readers a report of one of the projects undertaken by Doxiadis Associates. The first month (October) we included a digest of a regional plan for the area of Greater Mussayib in Iraq. Last month the subject was the preparation of master program and plan for the town of Kerbala, not far from the Greater Mussayib region. This month a shortened version is given of the preliminary report on planning for the future of the oil town of Kirkuk in the north of Iraq.

In every case the same general procedure has been followed: A study of the existing conditions, leading to a pin-pointing of the major problems which the master program must tackle: a statement of the policies which need to be adopted to provide solutions to these problems: finally a program of action which would arise from the acceptance of the policies laid down. Emphasis is always laid upon the dynamic character of planning and the word "program" is preferred to that of "plan" mainly because it automatically implies the incorporation of time, and therefore continuing adjustment and change.

During the next months examples will be presented of the work of Doxiadis Associates in a number of different countries.

It is also hoped that the next issue of Ekistics, the first issue of volume VII, will include the first of a series of "lead articles" by Dr. C.A. Doxiadis.

EKISTICS is compiled by Yvette and Lawrence Mann under the direction of Prof. J. Tyrwhitt. Enquiries or comments should be addressed to 7 Sumner Road, Cambridge, Massachusetts, USA.

NOTE: The lettering at the top of each page refers to Doxiadis Associates system of classification. The figures below each title refer to the Universal Decimal Classification.

HOUSING

D.E.K.S.T.

Hok, ir Liem Siang
TRADITIONAL HOUSING IN SUMBA, INDONESIA
Masalah Bangunan (Regional Housing Centre, Bandung, Indonesia), Vol. 1 : 2, October 1956. pp. 3-18. Illustrations.
728.03 (91)

1. This article on traditional housing in the administrative district of Sumba, which includes several other small islands, was prepared by Liem Siang Hok on the basis of a survey by Mr. Rachmad, a student of the Technical Faculty in Bandung. The survey or Sumba is part of a series of articles on "Traditional Housing in Indonesia" published by the Regional Housing Centre in Masalah Bangunan. In the next issue of EKISTICS, we shall present another abstract from it on housing in Bali.

2. Sumba, with a total area of about 11,150 sq. km., is bounded by the Sumba Str. on the North, the Sabu Sea on the East and the Indian Ocean on the South and West. It is the most southerly of the larger Indonesian islands, and is roughly parallel to the island chain which runs from Java to Timor. It is presently an administrative district with two sub-divisions or "wilajahs," which are divided in turn into "swapradjas" or self-governing states each of which has a native ruler.

3. Nearly half of Sumba consists of dry limestone hills which yield nothing but grass. There are only a few fertile valleys, mostly in West Sumba. Rice is cultivated in the West, by primitive techniques and implements; and maize and cassava are other crops. Buffaloes, white cows, goats, pigs and horses are raised. Horses are so extensively bred that "nearly everyone has a horse of its own," but anthrax is continually breaking out. Livestock is sold to other islands.

4. The total population of Sumba is about 202,000, making an average density of about 18 persons per sq. km. which is very low compared to that of Java's 350 persons per sq. km. There are two social classes, known as "kastas," the Free People (Tau Kabisu) and "Unfree People" (Tau Ata), but the general standard of living is very low.

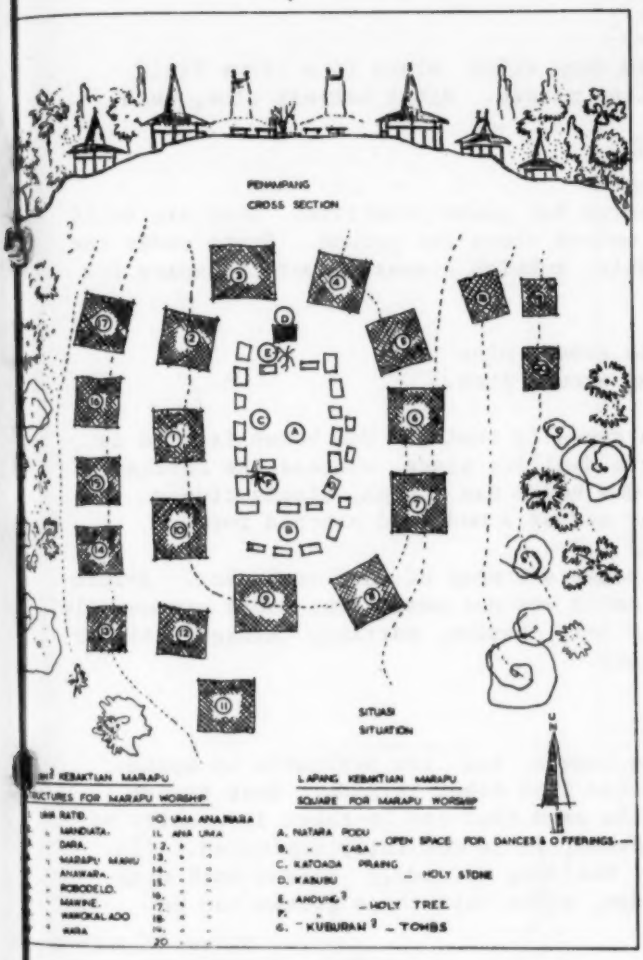
5. People live in large groups of families, or "Kabisu," in which the life of every member is ruled upon by a Board of Nature Men. A central belief of the people is in a supernatural force called "Marapu," which can enter lifeless objects, animals, or even humans.

Village Conditions

6. Because of their life of wild cattle breeding and dry field farming, the inhabitants of Sumba lead a nomadic existence. Three kinds of villages result:

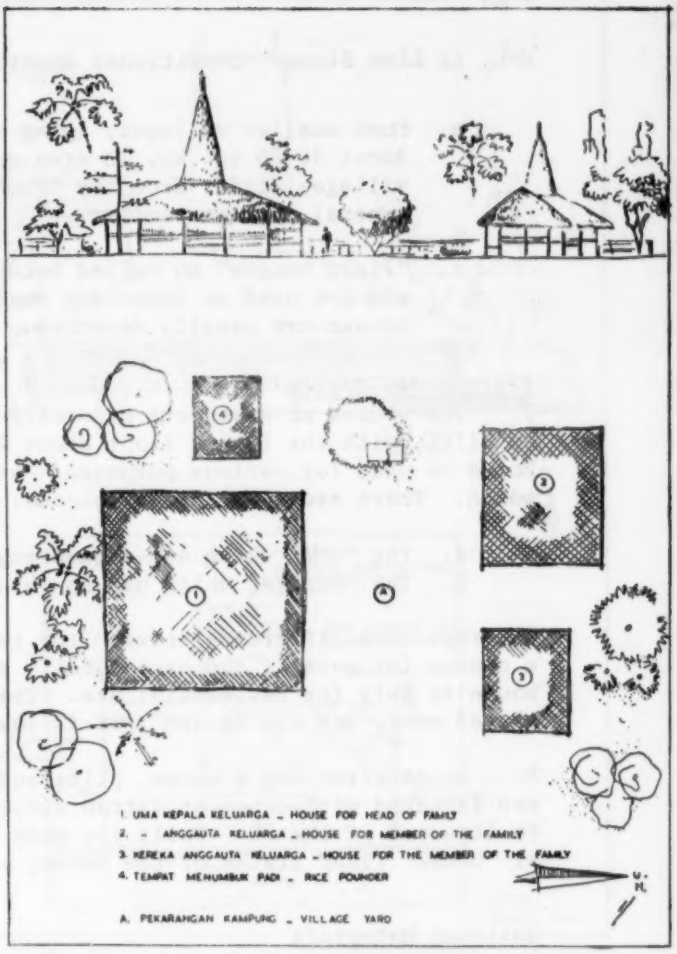
a. A "Praing", i.e. a village which is also used as a ceremonial center and burial area. "Praings" are usually situated on hilltops for two reasons. First, as a carry-over from the defensive sites of an earlier era of tribal wars; and second, because the people believe that many supernatural forces dwell there. These villages are about 80-100 sq. km. in area and normally consist of from 6 to 20 houses.

Masalah Bangunan, October 1956.



Gambar I / Figure I
Daerah kebaktian dari Kabisu Anawara. Letak rumah² disekitar kuburan leluhur Schaal 1 : 1000

Worship area of the Anawara family. Houses are situated around ancestral graves. Scale 1 : 1000


1. UMA KEPALA KELUARGA - HOUSE FOR HEAD OF FAMILY
2. " ANGGAUTA KELUARGA - HOUSE FOR MEMBER OF THE FAMILY
3. KEREKA ANGGAUTA KELUARGA - HOUSE FOR THE MEMBER OF THE FAMILY
4. TEMPAT MENUMBUK PADI - RICE POUNDER
A. PEKARANGAN KAMPUNG - VILLAGE YARD

Gambar II / Figure II
Kampung kebun dari Kabisu Anawara, Schaal 1 : 400

Campong of the Anawara family near the fields.

Foto 6.
Kuburan leluhur berupa tumpukan batu.

Megalithic grave of ancestors.

Hok, ir Liem Siang. Traditional housing in Sumba, Indonesia. --2

b. Much smaller villages, lying within easy reach of the place of work. About 30-60 sq. km. in area and having from 2 to 6 houses, these villages differ from the "Praings" in containing no graves; but the general form is similar.

c. "Field houses" so called because they stand alone in a large field and are used as temporary dwelling places. After harvest time, such houses are usually deserted.

Traditional Houses

7. The houses of Sumba are generally large but quite primitive. They are built on piles, with the living floor about 2 metres above the ground. Space under the house is used for various purposes: stable, rubbish disposal, working space for women. There are two kinds of houses:

a. The "UMA" which has a quadrangle ground plan
b. The "KEREKA" which has an oblong ground plan.

The important difference between the two types is that the Uma house is used as a centre for worship and occasionally as a dwelling place, whereas the Kereka house is only for residential use. The Uma house has a high, distinctively shaped roof, but the Kereka roof is lower and of a modified pitched form.

8. In constructing a house, piles and beams are made of wood or bamboo. Joints are fastened with ropes or rattan since nails are not used. The roofs are usually constructed of thatch. Walls are made of logs, bamboo, matting, "Minggit" timber or "bebak" (leaf stalks of the Gewang palm).

Building Materials

9. While timber, bamboo, thatch, gewang leaves, etc. are available in Sumba, more permanent materials must be transported from other islands. Most rivers contain more lime than sand; and the little sand that can be taken is usually of poor quality. Although lime abounds on Sumba, it is not fully exploited. (Indeed no mention of its use in traditional building is made.) Recent work with limestone in building a school and a bridge, shows that these stones can be easily worked with simple implements.

Sanitation

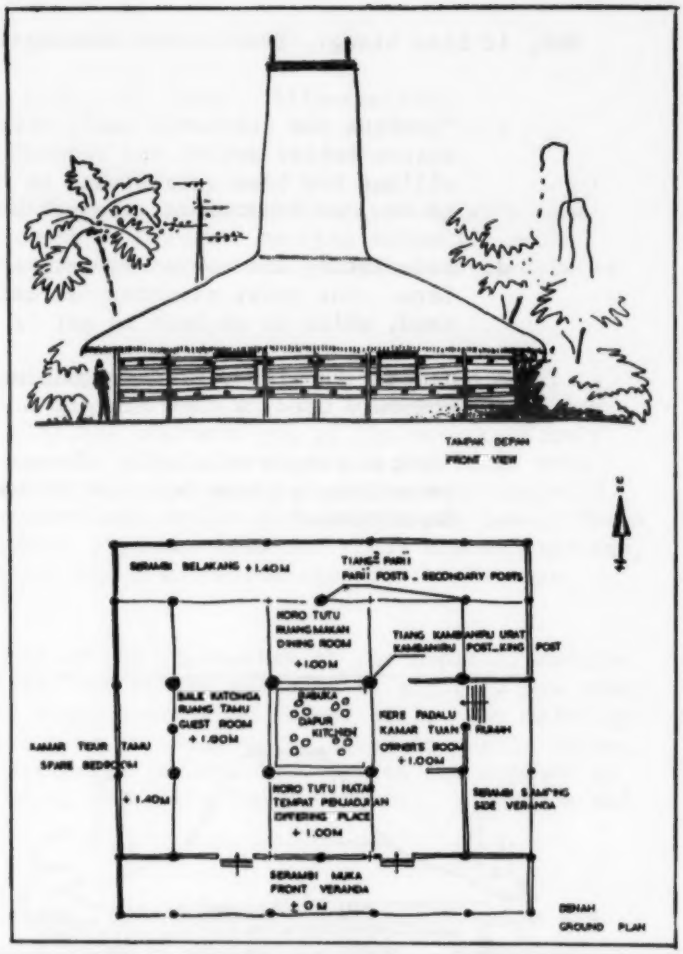
10. Many improvements in sanitation of the traditional houses need to be made. Spaces under the house, darkness and dirtiness of rooms, lack of ventilation (smoke vents and sunshine ports) all need attention. The tradition of locating the kitchen in the middle of the house is questioned.

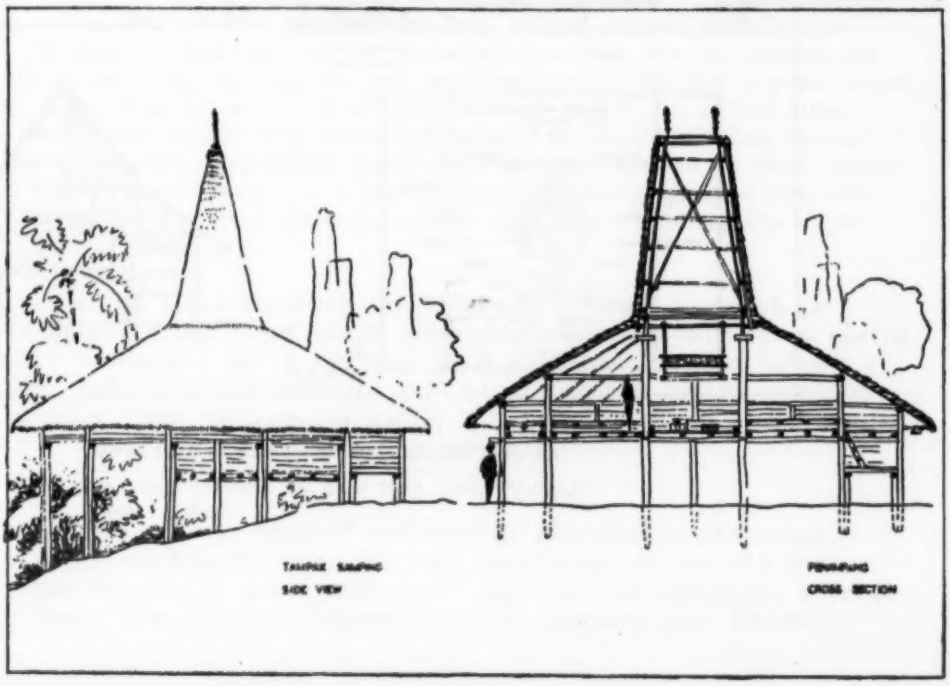
Recommendations

11. "The following steps can be taken to improve matters:

a. "Inform people on sanitation requirements, make them realize the importance of cleanliness and sunshine in the house.

b. "Improve construction of the house, with regard to smoke disposal, crack-free walls, crack-free flooring, etc.





Gambar III dan IV
Figures III and IV.

„Uma" sebagai tempat ibadah dan rumah tinggal.

The "Uma" house-type is a dwelling and worship place.

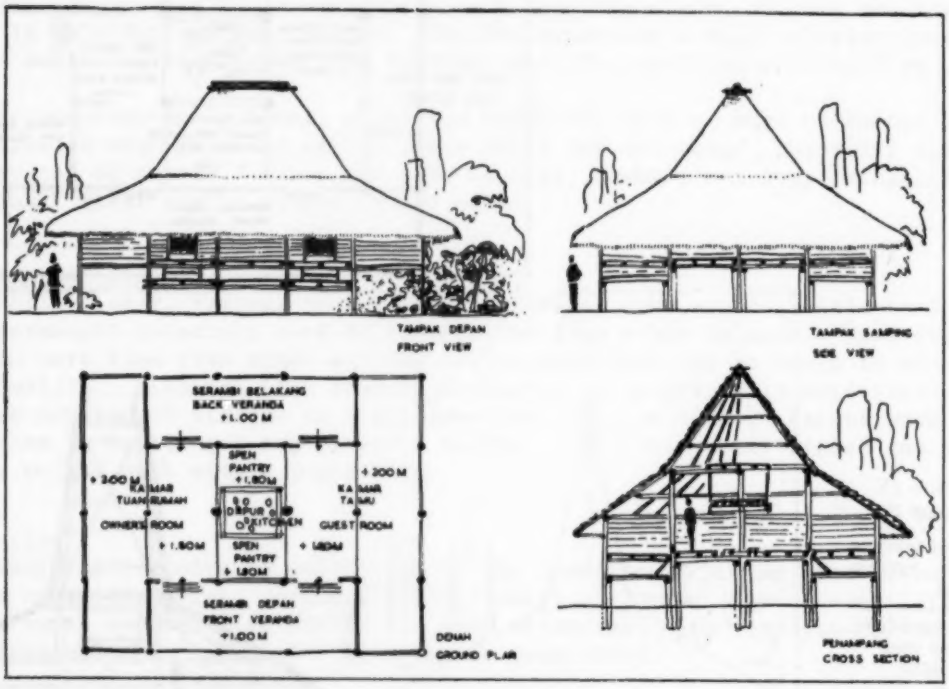
Scale 1 : 400

c. "Combine the scattered small villages into larger ones, to ensure better social and economical progress (a model village had been established in Lambanapu, in 1954, but up to now, no improvement can yet be perceived)."

d. Stimulating the use of limestone in blocks and in powder form. The great advantage in using this material is that sand, which is so hard to get is no longer needed.

e. "Impart knowledge of impregnating timber. The local specie commonly used is the "Minggit"

f. "Inform people of simple, cheap and practical house construction, such as been put to use by the People's Housing Department."



Gambar V / Figure V.
"Kereka" dipakai sebagai rumah tinggal sadja.

"Kereka" house type used as dwelling place only.
Scale 1 : 400

D.E.I.J.T.

Israel, Housing Division, Ministry of Labour
URBAN HOUSING IN ISRAEL
Tel Aviv: Haaretz Press Ltd., 1957. 28 pages. Illustrations.
728.3 (56)

1. This is a description of urban housing in Israel since 1948, with some attention to the new urban centers and to low-cost housing schemes. Architects A. Glikson and I. Mittelman and the Engineer A. Alweil were associated with most of the projects described and shown.

Jerusalem and "The Corridor"

2. Western Jerusalem has been the national Capital since 1948 and as it is only connected to the coastal plain by a narrow strip of land (the Jerusalem Corridor), the development of the Capital has been one of the most difficult national tasks. To overcome the age-old water shortage, new pipelines were laid to bring water from the coastal plain, and new industries were assisted to located in the Corridor. To attract and settle permanently the labour force required by Government offices, public organizations and these new enterprises, a large new immigrant housing project has been constructed in the Katamon Quarter.

3. In order to ensure the security of the approaches to the Capital, settlement of the Corridor was intensified, and at its entrance an entirely new town, Beit Semesh, was built on a fairly steep horse-shoe shaped hill. The majority of buildings in this town are built with concrete walls faced in rubble stone. One of the types of flat being constructed in both Beit Semesh and Katamon is a 52 sq metre unit containing a living room, two small bedrooms, a terrace and a kitchen with an enclosed balcony.

Qiriat Shemoneh: A new Immigrant Town

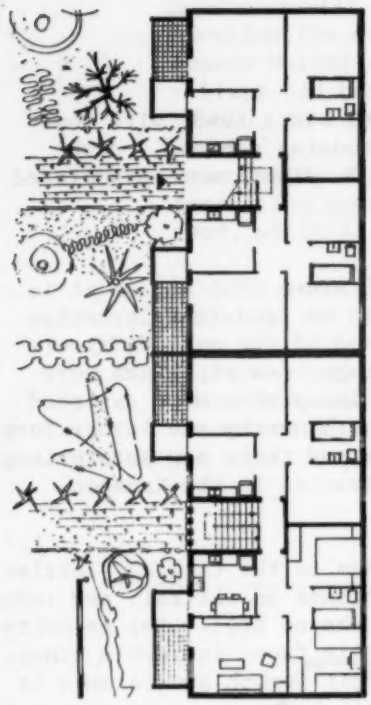
4. Established in 1950, this is Israel's northermost urban development project and has a population of about 8,000. It is the industrial, commercial and administrative centre for the new settlements in the recently reclaimed Huleh Valley. The Master Plan for Qiriat Shemoneh provides for an industrial zone, a large local and regional centre and housing facilities for a population of about 20,000. The town is situated at the foot of the Hills of Galilee. The lower part, built on level land, consists mainly of semi-detached houses and auxiliary farms, whereas the upper part (on the hill slopes) is more densely built up and consists of groups of 2 and 3 story apartment houses and row houses. The town centre is being constructed on the line dividing the upper and lower parts of the town.

5. One of the types of flats recently constructed in Qiriat Shemoneh is a 48 sq metre unit which in its first stage contains a comparatively large living room and two small bedrooms. As is the case with all recently constructed immigrant housing, this is a sub-standard unit providing for future extension--in the second stage a large terrace and another room can be added at the gable-end to convert the flat into a sizeable standard-type unit.

Ashkelon

6. Called "the gateway to the Negev," Ashkelon is situated on the coast. Since 1948, two large new housing quarters have been added to the old town of Migdal, one of them founded by South Africans. The town has attracted several new industries, among them Israel's largest precast concrete pipe factory,

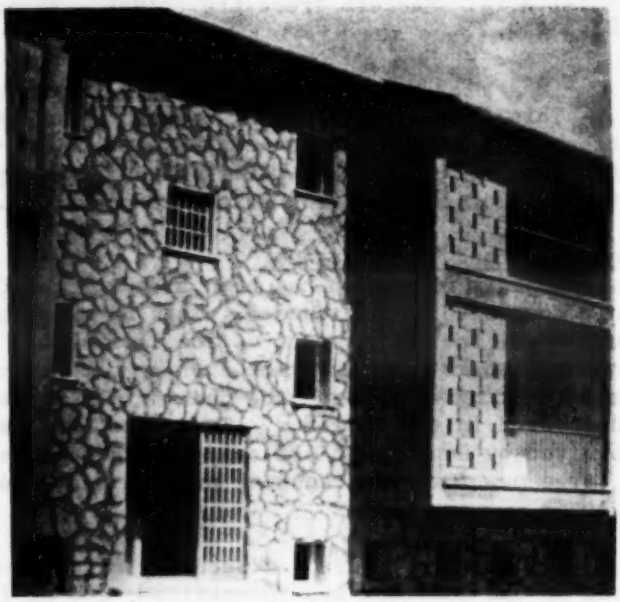
Israel, Housing Division, Ministry of Labour. Urban housing in Israel.



2

דירה בת 52 מ"ר (3, 4)
52 sq.m. flat (3, 4)
Appartement de 52 m² (3, 4)

Beit Shemesh



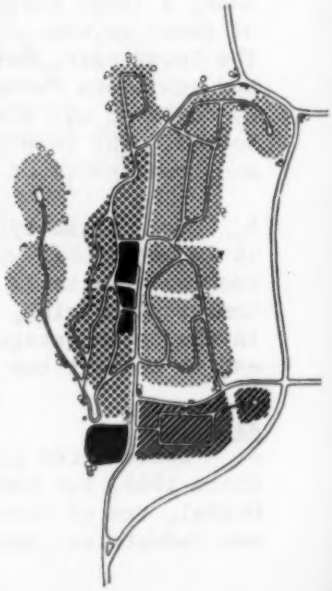
4

בית שמש
Beit Shemesh
Beth Shemesh

5

דירה להרחבה בת 48 מ"ר (6)
48 sq.m. extensible flat (6)
Appartement extensible de 48 m² (6)

Qiriat Shemoneh

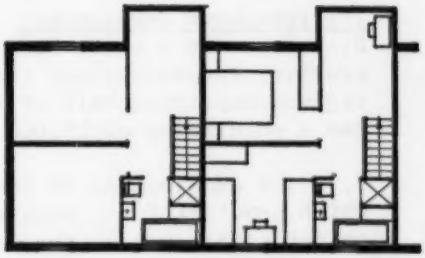


7

תכנית אב
Master Plan
Plan général

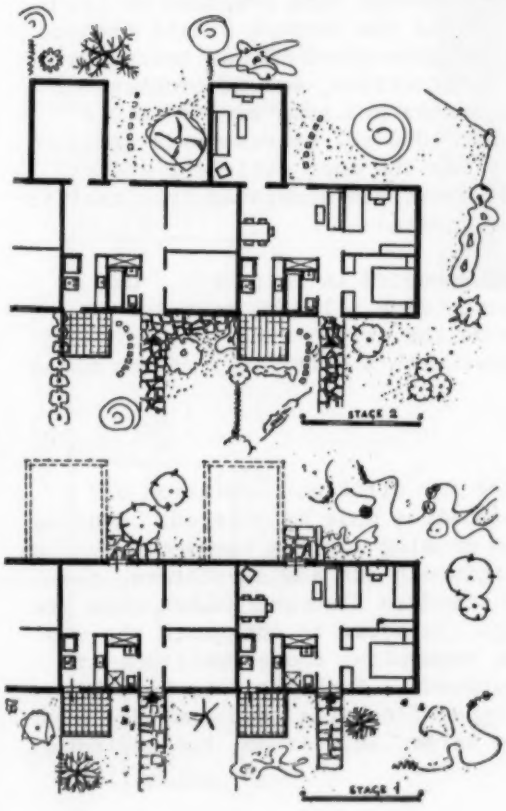
Israel, Housing Division, Ministry of Labour. Urban housing in Israel.

Ashkelon 21
בתים טוריים — שלב 1
Row-houses — 1st stage
Maisons en rangées — 1re. étape

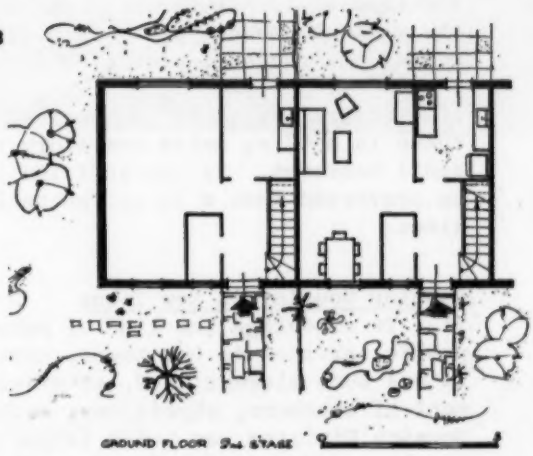


FIRST FLOOR 2nd STAGE

Beersheva 27
בית טורי להרחבה בן 42 מ"ר (25, 26)
42 sq.m. extensible row-house (25, 26)
Maison en rangée extensible de 42 m² (25, 26)



23



GROUND FLOOR 2nd STAGE

Ashkelon 23
בית טורי מורחב בן 66 מ"ר
66 sq.m. extension
Maison en rangée agrandie à 66 m²

which also manufactures concrete building elements. Agriculture and tourism are additional sources of employment.

7. One of the types of immigrant houses being constructed is a 32 sq metre row-house, which in spite of the limited area contains two separate small bedrooms, living space and a kitchen. By the addition of a second floor, the unit can be converted into a 66 sq. metre terrace house. These row-houses have an added advantage as far as extension is concerned, since the second floor can be built by the individual tenants. In converting two story apartments to three stories, the consent of several tenants is required. A typical new quarter in Askelon includes, besides the extensible row-houses, kindergartens, shops, and a synagogue.

The Beersheva Development

8. Formerly a small Beduin market town, Beersheva has become the administrative, industrial and economic centre of the Negev -- Israel's southern region comprising half of the country's total land area. The city presently has a population of 25,000.

9. The development of Beersheva is based on a Master Plan prepared in 1950 which provides for a population of 60,000. (It is the largest single project so far undertaken by the Housing Division.) Neighbourhood "B" of Beersheva is the fourth new quarter of the city under construction, and it consists of a variety of row-houses, 2-3 story apartment houses and some semi-detached houses. There are an average of 3.3 houses per 1000 sq. metres gross area. The general layout has been designed to allow for the most efficient use of the various house types. Pedestrian ways and parks are separated from traffic roads, and there is provision for a number of squares.

10. Several types of row-houses have been constructed in Beersheva. One of these is a 42 sq metre one-story row-house containing a living room and two small bedrooms. By the addition of one room on the garden-side, the unit can be converted into a 55 sq. metre L-shaped house with a patio enclosed on three sides.

Popular Housing in New Towns

11. To encourage the kind of personnel needed for efficient operation of public services in new towns, certain pre-requisites must be offered. Housing is one such element; and, to provide adequate housing for the permanent settlement of teachers, physicians, technicians, engineers and administrators, the Housing Division has built larger and higher standard flats and houses than are usually provided in initial immigrant housing. In order to integrate the old and the new for successful development of the community, these dwellings are located within the immigrant housing neighbourhoods. Such projects have been carried out so far in eight new towns. One type of housing used has been a 68 sq. metre semi-detached house consisting of a large living-room, two bed-rooms and a hall.

Popular Housing in Existing Towns

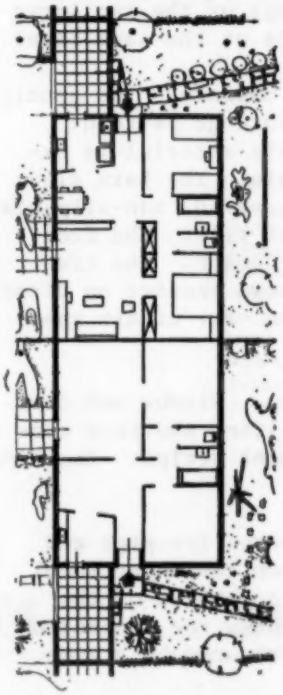
12. A flood of immigration prior to 1940 complicated by events during and after World War II, meant that Israel was faced with a extreme housing crisis with deteriorated structures, spreading slums, and terrible over-crowding. A major lack was for long term investments in housing. To deal with both the

Israel, Housing Division. Urban housing in Israel. --3

need for more housing and the need for more investment in building, the Popular Housing Scheme was started by the government. With financing partly by future tenants and partly by the government (in the form of long-term loans) 13,800 flats have been constructed under this scheme. These have been constructed mainly around Jerusalem, Tel-Aviv and Haifa, but also in some smaller towns and in Arab neighbourhoods. In Holon (near Tel-Aviv) a self-contained neighbourhood of $2\frac{1}{2}$ and 3-room flats was built during 1953-54.

Holon
near Tel-Aviv

בית דו"מ בן 68 מ"ר
68 sq.m. semi-detached house
Maison bi-familiale de 68 m²



E.F.L.S.T.

Luccichenti, Ugo
MODEL FARM NEAR OSTIA, ITALY
International Asbestos-Cement Review (AC) No. 11, English Edition, Vol. 3:3, July 1958., pp. 33-38. Illustrations.
631.2 (45)

1. This article is one of a series on farm architecture published in this issue of the review cited. Ugo Luccichenti studied engineering at the University of Rome and has carried out several notable architectural works.

2. In Casalpalocco, a small community not far from Rome, a model farm has been set up on the extension of the main street of a new residential quarter, to provide the local inhabitants with milk, fruit and vegetables--thanks to its modern provisions for dairy production and deep freeze storage. The farm occupies an area of one hundred acres.

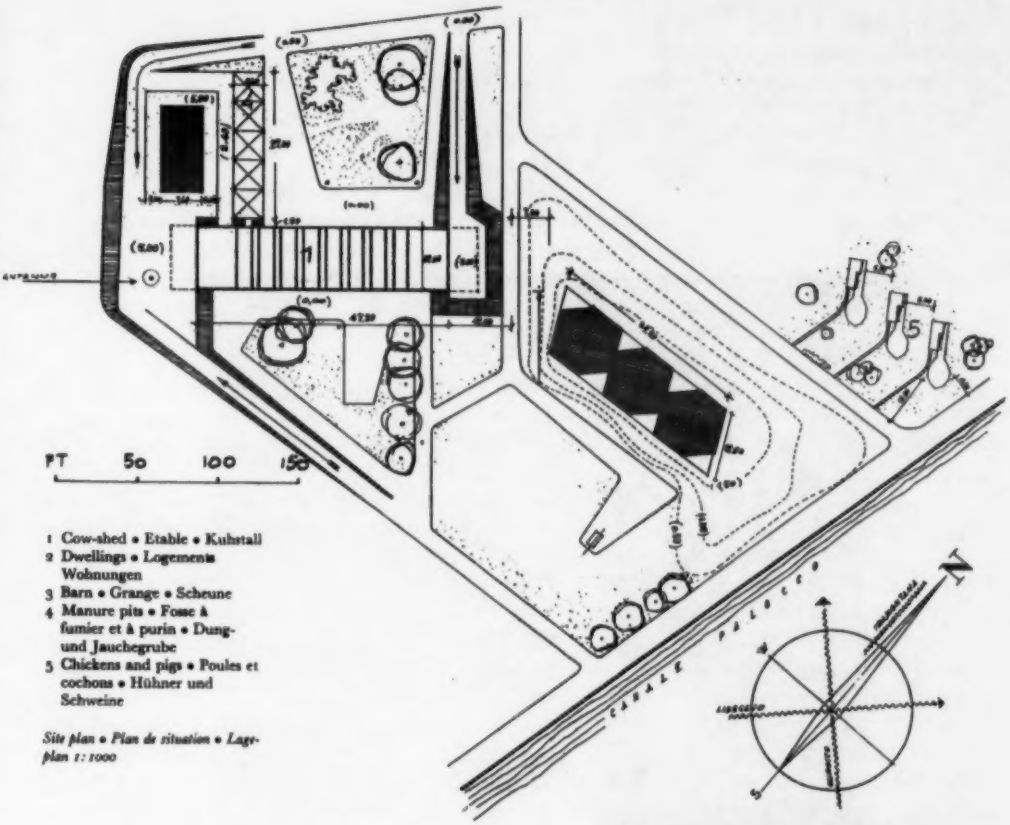
3. On the upper level of the 2-storey cow barn, which is accessible to heavy vehicles by a ramp of compacted earth, 44 milk cows are housed; and stalls are provided for calves and a bull, as well as space for auxiliary rooms. A mechanical milking machine takes milk directly from the cow to the area for pasteurization processing. Manure can be shoveled through openings in the floor of the central corridor onto carts below which then transport it over a gangway on the ground floor to the manure bins. Accumulated liquid manure is collected in pumps and continually sprayed over the dung in order to speed up the ripening process or pumped directly out to the fields. The rest of the ground floor is occupied by vehicles and equipment. The approach ramps to the stable also form the access to the loading openings of the two large silos. The asbestos-cement clad roof of the hay bin lies at the same level.

4. The barn is constructed of reinforced concrete and masonry. The gently sloping roof is clad in asbestos-cement sheets laid in lozenge pattern. Ventilation ducts are also of asbestos-cement because this material is extremely resistant to the corrosive effluvia of the animals. The barn floor is of ceramic tile and the floors of the cow stalls of grooved, non-slip clay tile. Walls are clad to a height of 6ft 7in with glazed tile. The front sides of the feeding troughs are covered with asbestos-cement. The trapezoid-shaped window openings are so arranged that the cows receive no direct currents of air. Ventilation is excellent, with 1,410 cu. ft. of air space per animal.

5. The row-houses of the workers lie some distance away. Window and door openings facing the sun can be closed off by means of sliding shutters consisting of wood frames with an infilling of aspectos-cement strips. The roofs, too, are clad in asbestos-cement sheeting.

6. Each dwelling has a vegetable garden. Two-storey barns for pigs and chickens are grouped together. By placing the chickens on the upper level over the pigs, the body warmth of the pigs is used to the benefit of the chickens. A stairway with asbestos-cement steps forms the connection between the chicken coops and the fowl-run, which is surrounded by a wire fence supported on asbestos-cement posts.

International asbestos-cement review, July 1958.

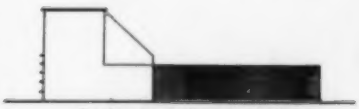


1 Cow-shed • Etable • Kuhstall
2 Dwellings • Logements • Wohnungen
3 Barn • Grange • Scheune
4 Manure pits • Fosse à fumier et à purin • Dung- und Jauchegrube
5 Chickens and pigs • Poules et cochons • Hühner und Schweine

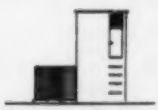
Site plan • Plan de situation • Lageplan 1:1000

1 Piggery • Porcherie • Schweinestall
2 Chicken hutch • Poulailler • Hühnerstall
3 Stairs for chickens with asbestos-cement treads • Escalier à poules avec marches en amiante-ciment • Treppe für Hühner mit Asbestzement-Tritten
4 Chicken run • Basse-cour • Auslauf für Hühner

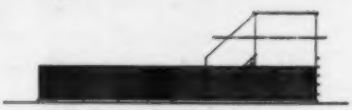
t • Sud-est • Südost



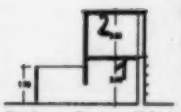
Southwest • Sud-ouest • Südwest



Northwest • Nord-ouest

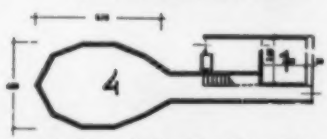


Northeast • Nord-est • Nordost

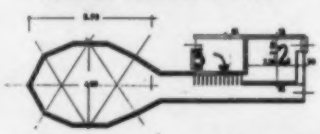


Section • Coupe • Schnitt

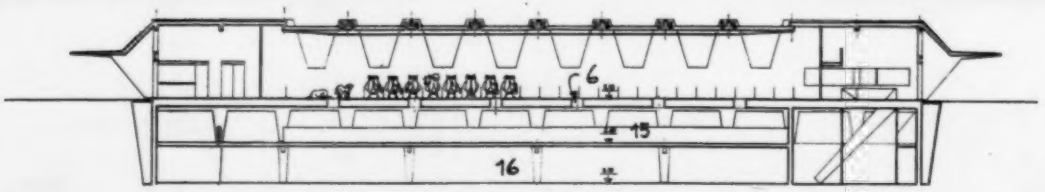
FT. 10 20 30

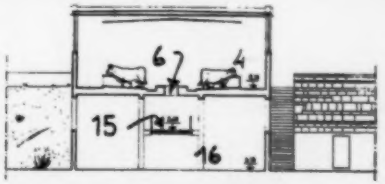


Lower level • rez-de-chaussée • Erdgeschoß

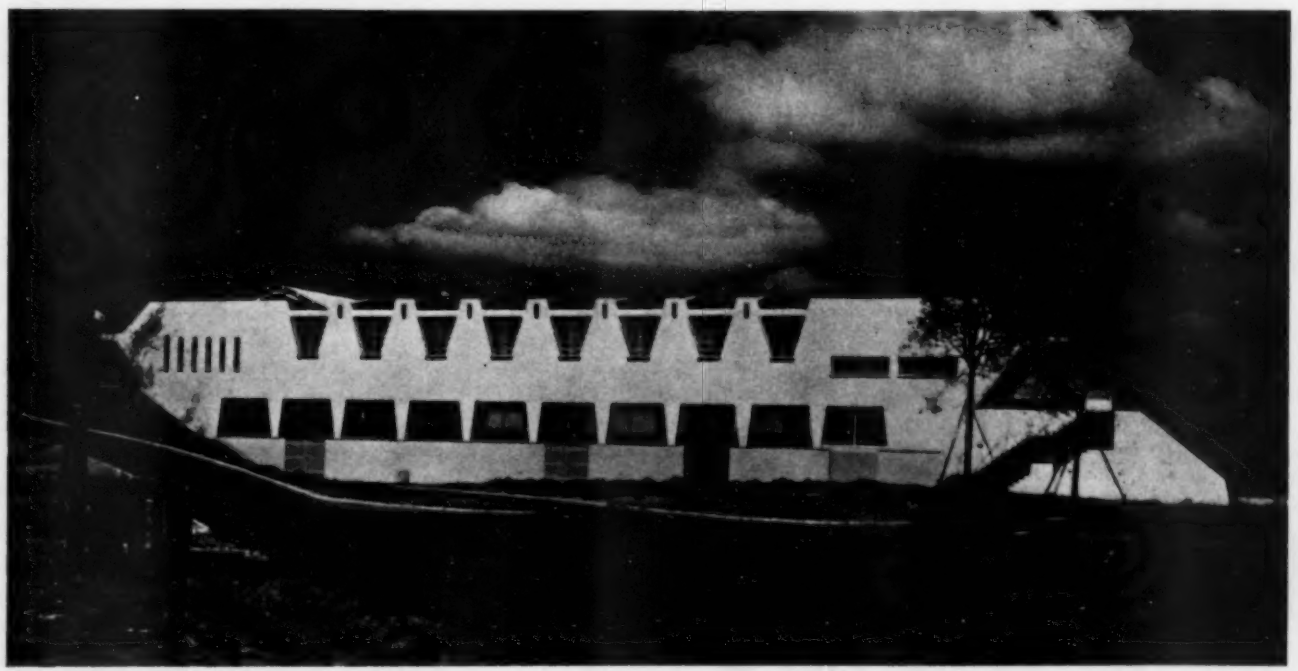


Upper level • premier étage • Obergeschoß 1:300





1 Office • Bureau
2 Janitor • Gardien
Wächter
3 Fodder preparation
Fourrage
Futterzubereitung
4 Cows • Vaches • Kühe
5 Feeding passage • Corridor
Futtergang
6 Manure holes • Dévaloir à
fumier • Dungabwurf
7 Mechanical milking
Installation de traite
Mechanischer Melkstand
8 Calves • Veaux • Kälber
9 Bull • Taureau • Bulle
10 Milk cans • Bidons
Kannenraum
11 Milk storage • Laiterie
Milchkammer
12 Milk refrigerating chamber
Frigorifique pour le lait
Kühlraum für Milch
13 Cool storage for vegetables
Frigorifique pour les
légumes • Kühlraum für
Gemüse
14 Cheese and cream tests
Fromagerie et crémerie
Käserei und Rahmproben
15 Gangway for manure carts
Passerelle pour charrette à
fumier • Passerelle für
Dungkarren
16 Implements and vehicles
Remise des véhicules et des
outils • Geräte und
Fahrzeuge



E.N.T.

Royal Institution of Chartered Surveyors (Great Britain)
COMPARATIVE COSTS OF FLATS AND HOUSES - Part Two.
Architect and Building News, 13 August 1958. pp. 223-224.
69.003.12 : 728 (420)

1. Last month we summarized the report of the Cost Research Panel set up by the Royal Institution of Chartered Surveyors to study the comparative cost of flats and houses. We indicated that we would provide additional information from the appendix to this report as it became available. The appendix, which we summarize below, gives a brief specification and tabulated analysis and comparison of costs for the three types of dwellings investigated: two-storey semi-detached, three-storey flats, and eight-story flats.

The Two-Storey Semi-Detached House

2. The house has a net floor area of 887ft super and a room height of 7ft 9in, and it is taken from a contract for 155 dwellings. The substructure is of solid brickwork on concrete strip foundations and includes the concrete ground-floor slab. The superstructure is considered in its several components. The exterior brick walls are of cavity construction, having 4.5in brick outer skin and breeze inner skin. Internal partitions are of breeze and prices include costs of concrete lintels and sundries. The price shown includes extra cost for facing bricks. Floors and staircases are of timber and the price shown also includes that of timber floor boarding to the first floor. Window frames and external doors are of softwood, with their stated price including glazing and painting. External plumbing includes lead flashings, cast-iron rainwater gutters, down pipes, etc.

3. Internal finishings include plastering and wall tiling, internal decoration, pitchmastic flooring to ground floor with quarry tiles in kitchen and internal joinery. Fittings and services provided were softwood cupboards, boilerback fireplace for hot water, chimneys, internal plumbing, gas installation (at a concession rate) and electrical installation.

The Three-Storey Flat

4. This flat is in a block containing 27 dwellings, 3 one-bedroom, 3 two-bedroom and 21 three-bedroom. The flats are of staircase access design with 21.5 per cent of the floor area in access space. The average net area of each dwelling is 680ft super and the room height is 7ft 6in. The substructure is of solid brickwork on concrete strip foundations and includes the concrete groundfloor slab. For the superstructure, external brick walls, interior partitions and external plumbing include the same features described for the semi-detached house, including also facing bricks as a separate cost. Floors and staircases are of *in situ* reinforced concrete, and the cost of balconies are included in this category. Windows and external doors are of steel. Roofs are pitched and constructed of softwood covered with clay Double Roman roof tiling. Balcony facings and balustrades are of a pre-cast reconstructed stone and wrought-iron.

5. Internal finishings provided in this flat are similar to those in the semi-detached house, except for floor coverings. Thermoplastic tiles are used in the flat, while pitchmastic flooring was installed in the house. Fittings and services in the three-storey flat included all those in the house and added gas drying cabinets for laundry.

Royal Inst. of Chartered Surveyors. Cosparative costs of flats and houses -2

The Eight-Storey Flat

6. This analysis is of a flat in an eight-storey block containing 110 dwellings, 14 two-bedroom and 96 three-bedroom units. Flats are of balcony access, slab design, with 18.1 per cent of the floor area in tenants' stores, lifts and access space. The average net area of each dwelling is 700ft super and the room heights 7ft 10in. For the substructure, costs include piled foundations, reinforced concrete ground beams and suspended ground-floor slab. For the superstructure, the structural frame is of reinforced concrete column and beam construction with in situ reinforced concrete floors, stairs, balconies and lift wells; and insulation is included in costs. Walls are similar to those in the other kinds of dwellings, except that the inner skin on external walls is of plaster, and internal partitions are of patent plaster-board construction. Facing bricks were more expensive on this project. Window frames were of steel, as were external doors. Roofs are of in situ reinforced concrete covered with asphalt, with insulation provided for. Balcony facings and balustrades are as in the smaller block of flats, and external plumbing is comparable to both of the other housing types.

7. Internal finishings in this block resembled those in the smaller block. There are several significant differences in fittings and services, however. Refuse chutes (gravity type with standard hopper fittings), higher standard electrical installations, elevators, and lightning conductors are special costs in this type of dwelling. Otherwise, fittings and services resemble those in the smaller block in most significant details.

TABLES

RELATIVE COSTS PER FOOT SUPER IN SHILLINGS

Component	Table 1 Two-storey House		Table 2 Three-storey Flat		Table 3 Eight-storey Flat	
(1) Substructure ..	3·05	3·05	2·85	2·85	4·97	4·97
(2) Superstructure						
Structural Frame ..	—		—		16·80	
Brick Walls and Partitions	5·88		6·85		4·88	
Facing Bricks ..	1·08		1·29		0·60	
Floors, Staircases and Balconies	1·81		5·47			
Windows and External Doors	2·61		2·18		2·78	
Roofs and Roof Coverings ..	2·55		2·34		2·14	
Balcony Balustrade ..	—		0·56		1·86	
External Plumbing ..	1·03	14·96	0·62	19·31	0·37	29·43
(3) Internal Finishings						
Plastering and Wall Tiling	2·08		4·24		2·94	
Internal Decoration ..	1·23		2·21		1·06	
Floor Covering ..	0·56		2·32		1·77	
Internal Joinery ..	1·28	5·15	2·41	11·18	1·43	7·20
(4) Fittings and Services						
Cupboards	0·83		1·12		1·54	
Open Fires and Chimneys	0·95		1·32		1·60	
Internal Plumbing ..	2·08		4·62		4·60	
Refuse Chutes ..	—		—		0·29	
Gas Installation ..	0·22		0·24		0·20	
Gas Drying Cabinets	—		0·91		0·89	
Electrical Installation	0·70		1·97		1·97	
Lifts	—		—		1·86	
Lightning Conductors	—	4·78	—	10·18	0·03	12·98
Total (in Shillings)		27·94		43·52		54·58

RELATIVE COSTS PER DWELLING

Component	Table 1 Two-storey House		Table 2 Three-storey Flat		Table 3 Eight-storey Flat	
	£	£	£	£	£	£
(1) Substructure ..	135	135	97	97	174	174
(2) Superstructure						
Structural Frame ..	—		—		588	
Brick Walls and Partitions	261		233		171	
Facing Bricks ..	48		44		21	
Floors, Staircases and Balconies	80		186		—	
Windows and External Doors	116		74		97	
Roofs and Roof Coverings ..	113		80		75	
Balcony Balustrade ..	—		19		65	
External Plumbing ..	45	663	21	657	13	1,030
(3) Internal Finishings						
Plastering and Wall Tiling	92		144		103	
Internal Decoration ..	56		75		37	
Floor Coverings ..	25		79		62	
Internal Joinery ..	57	230	82	380	50	252
(4) Fittings and Services						
Cupboards	37		38		54	
Open Fires and Chimneys	42		45		56	
Internal Plumbing ..	92		157		161	
Refuse Chutes ..	—		—		10	
Gas Installation ..	10		8		7	
Gas Drying Cabinets	—		31		31	
Electrical Installation	31		67		69	
Lifts	—		—		65	
Lightning Conductors	—	212	—	346	1	454
Total		£1,240		£1,480		£1 910

PLANNING

TABLE 3

ht-storey Flat
£
174
1,030
252
454
£1 910

D.I.O.

Ishida, Nobuo (unpublished correspondence) and
New York Times, April 6, 1958, p. 10
MODEL COMMUNITY FOR TOKYO'S RAGPICKERS
711.58 (52)

1. This article has been pieced together from a journalist's report and the careful translation of a student program kindly prepared by Prof. Imai of Waseda University. Nobuo Ishida is the student who undertook a study of the proposed ANT-TOWN on a volunteer basis while at Waseda University.

2. The ragpickers of Tokyo roam the streets long before dawn. They collect anything they can find: waste paper, broken glass, rags or bits of metal. Almost anything helps. Available statistics indicate that the amount of rubbish accumulated in the city monthly is very large: waste paper alone, which can be reclained, is worth nearly 430.000,000 yen each year. Later in the morning, the busy "ants" (so called because of their industrious habits) make house-to-house calls or visit small factories to buy old newspapers, empty bottles or tin cans. During the afternoons the material is sorted and sold to dealers.

3. About ten years ago, a small group of ragpickers started building makeshift huts in an abandoned riverside park of northeast Tokyo. This group's community now provides for about three hundred inhabitants, and is known locally as Ant Town. It is a highly respected community and social workers praise the increasingly stable social security system developed in private by this hard working group of professional scavengers.

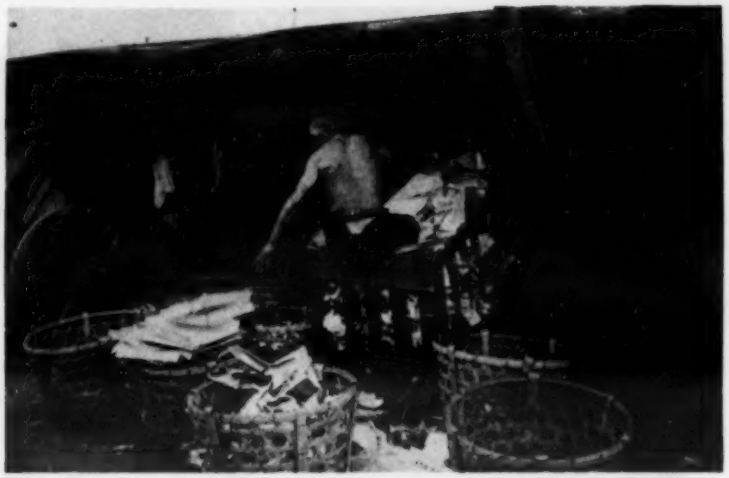
4. Though the group started with nothing it now holds in common property valued at more than $55,000. By paying small daily contributions to the community, members get modest wedding, funeral and medical services free. Living quarters are far below the public standard, but they are free of rent. Aged members no longer able to work are supported by the group. Recently, the community acquired its own graveyard.

5. An efficient division of labor has been worked out within Ant Town. While the main body of the ragpickers works at the daily task, one member stays behind to clean all the living quarters and another prepares the traditional comfort of the bath house. The busy schedule of their way of life leaves the ragpickers little time for the care of children, and there must be someone to fill this role. Until last winter, Miss Reiko Kitahara, a daughter of a college professor, had devoted eight years to this task--nursing the children teaching them home crafts, and organizing recreational activities. A Catholic, Miss Kitahara was called the "Madonna of Ant Town" by the group; and at the time of her death last January, about 10 per cent of the group had joined her religion.

6. The elderly leader of Ant Town, Mr. Ozawa, feels that the group is moving slowly toward lifelong security for its members. At the same time, the community is expected to grow--with a total membership of 1000 expected within five years. In planning their expansion, the town leaders felt that a new site was needed since the present location is part of a public park and buildings are only makeshift structures of scrap boards and metal. The Tokyo government has granted the ragpickers' group the right to buy about five acres of waterfront land at a fair price.

Ishida, Nobuo. Model community for Tokyo's ragpickers

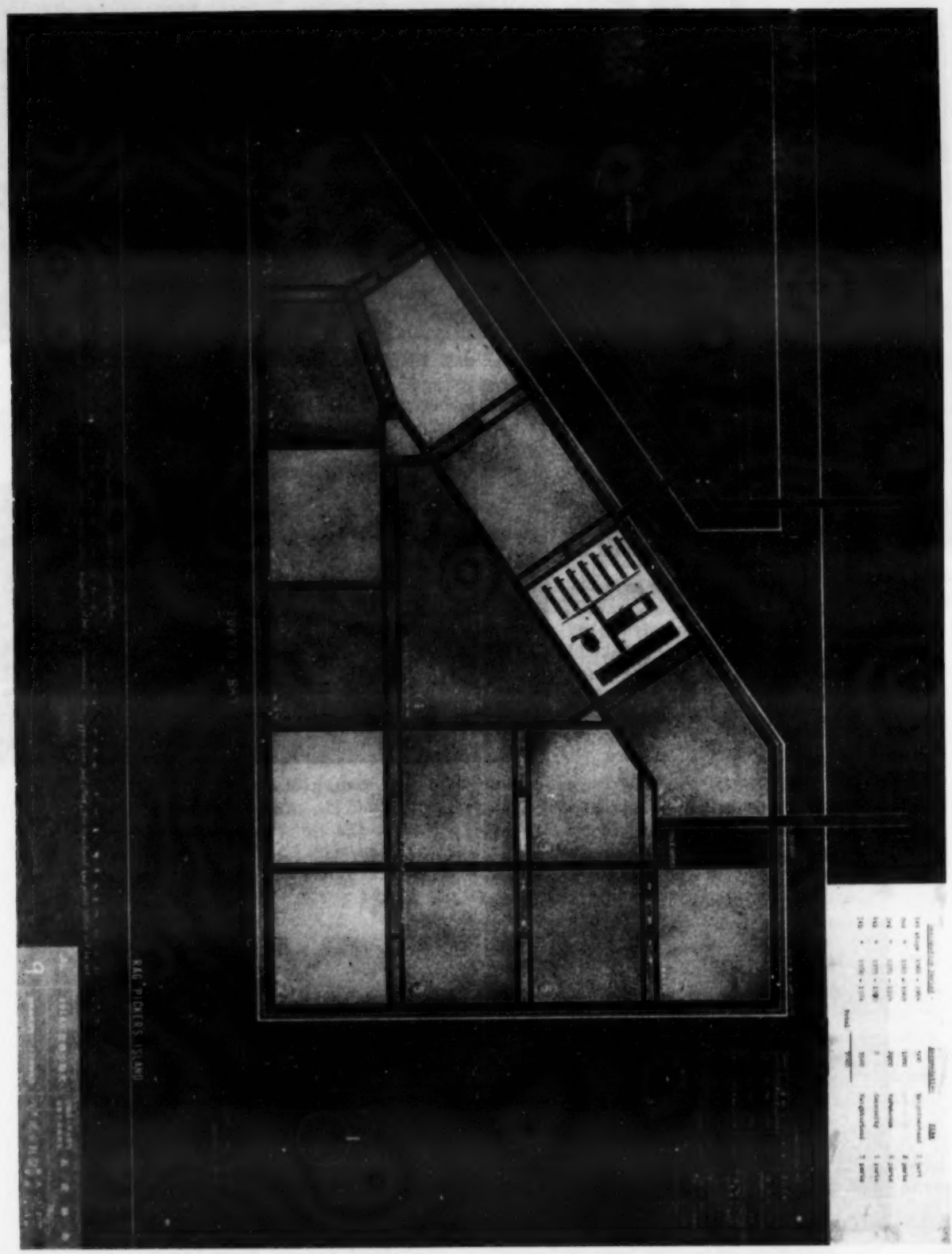
Leader of Ant-Town picking rag at the down town of Tokyo.



Selecting of rags, Ant-Town

Accumulation of cans, Ant-Town

The building site has been selected on reclaimed ground from Tokyo.



Ishida, Nubuo and New York Times. Model community for Tokyo's ragpickers -2

7. A group of engineering students at Waseda University volunteered to design buildings for the new community, phased for construction in five consecutive five-year periods. Included in the plan for the town are apartments, a church, a dining hall, a nursery and a bath house. Recreation areas are set aside, and enough yard remains for livestock (1000 chickens and 20 pigs).

8. A detailed survey of the site resulted in the division of the area into sixteen parts. Fourteen of the these parts will be devoted to the neighborhood community which will ultimately accommodate seven thousand people. Large storehouses are also to be built. During the first five years a neighborhood community for five hundred persons is being planned.

9. In the design study, the use of communal facilities was encouraged wherever possible, though expenditures are discouraged for economic reasons. Since residents spend most of their time on the upper floor of the buildings, long corridors are used to facilitate departure for school, shopping, etc. The area for industrial facilities is determined by consideration of present and predicted quantities of rubbish related to floor space.

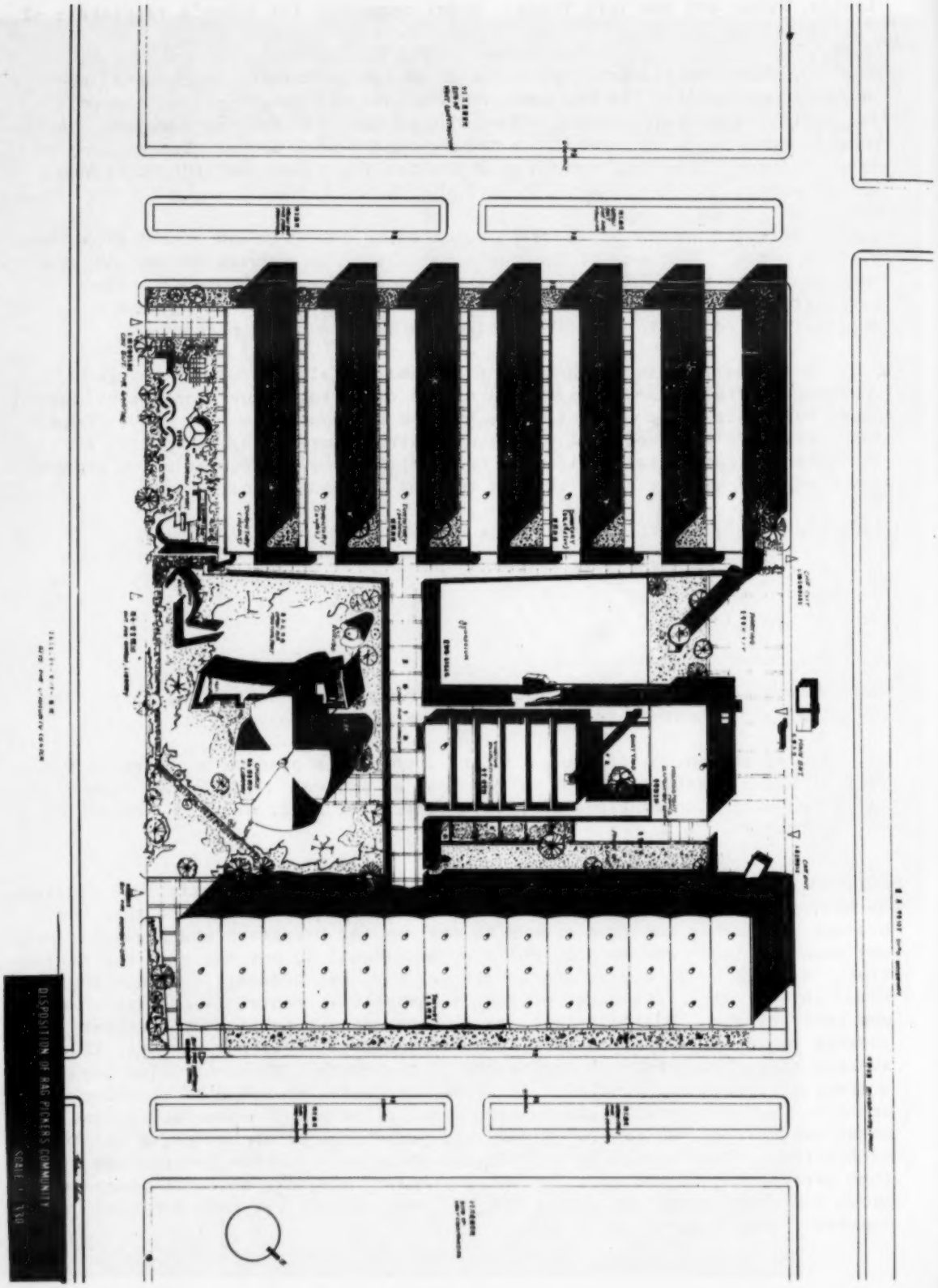
10. Sleeping quarters of four types are provided in the plan:

a. Bachelors' rooms (3 per room)
b. Couples' rooms
c. Infants rooms, and
d. Nurses' rooms.

Room arrangement are flexible and can be changed when situations vary. The principal adjustment is accomplished by removable panels.

11. A unified control of equipment and machines is planned as there is a central administrative control of Ant Town at present. In the new community, the group will also continue to retain control of food, clothing, education and recreation.

EDITORS NOTE: The ragpickers have also been subjected to statistical studies, as has the "economic base" of their community. It has been found that the average dweller in Ant Town spends 8¢ per day for breakfast and about 11¢ per day each for lunch and supper, while an additional 4¢ per day goes for teatime. Rent is about a cent and a half per day, but bedding is nearly four times this figure. All other utilities except cart rental (4.2¢) are under one cent per day. Daily savings are 5.5¢ per day--a habit many American savings banks would like to have families immitate. Without savings, the average ragpicker spends not quite $16.00 per month. There has also been a study of pleasure expenses in Ant Town, for selected kinds of pleasure seekers: a literary enthusiast, narcotist, dipsomaniac, horserace maniac and woman hunter. It was concluded that the percentage of income going to pleasure activities increases according to degree of poverty. Other indications are that horseracing is the most expensive pleasure and narcotics the cheapest. Books and women appear to cost about the same amount, but both are more expensive than liquor.


DISPOSITION OF RAG PICKERS COMMUNITY

Ishida, Nubuo and New York Times. Model community for Tokyo's ragpickers -3

A study of waste paper has been done by the Welfare Ministry and the Japan Paper Association. It was found that 22,500 tons of paper were distributed in Tokyo, of which 10% was waste. In the USA the rate is 40%, and if it is assumed that Japan will one day reach that situation, we can expect 6,750 tons of paper to be produced from collected waste. It is said that this would mean a monthly income of $10.000. Since a minimym wage for living is about $16.00 per month, it can be seen that theoretically 7,000 jobless and homeless people might thus be provided for.

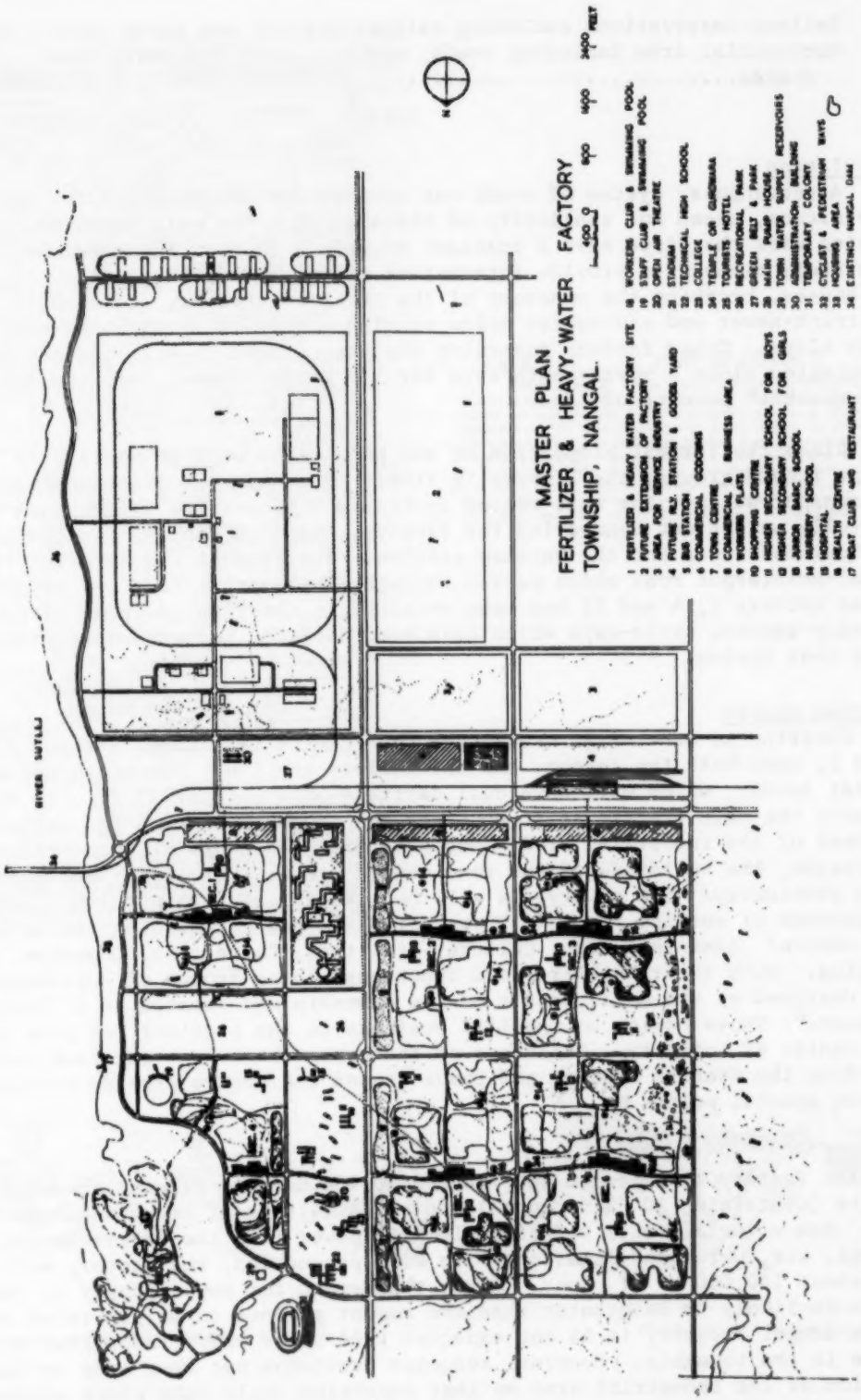

MASTER PLAN
FERTILIZER & HEAVY-WATER FACTORY
TOWNSHIP, NANGAL.
400 0 800 1600 2400 FEET
RIVER SUTLEJ
1 FERTILIZER & HEAVY WATER FACTORY SITE
2 FUTURE EXTENSION OF FACTORY
3 AREA FOR SERVICE INDUSTRY
4 FUTURE R.R. STATION & GOODS YARD
5 BUS STATION
6 COMMERCIAL GOODSHS
7 TOWN CENTRE
8 COMMERCIAL & BUSINESS AREA
9 WORKERS FLATS
10 SHOPPING CENTRE
11 HIGHER SECONDARY SCHOOL FOR BOYS
12 HIGHER SECONDARY SCHOOL FOR GIRLS
13 JUNIOR BASIC SCHOOL
14 NURSERY SCHOOL
15 HOSPITAL
16 HEALTH CENTRE
17 BOAT CLUB AND RESTAURANT
18 WORKERS CLUB & SWIMMING POOL
19 STAFF CLUB & SWIMMING POOL
20 OPEN AIR THEATRE
21 STADIUM
22 TECHNICAL HIGH SCHOOL
23 COLLEGE
24 TEMPLE OR GURDWARA
25 TOURISTS HOTEL
26 RECREATIONAL PARK
27 GREEN BELT & PARK
28 MAIN PUMP HOUSE
29 TOWN WATER SUPPLY RESERVOIRS
30 ADMINISTRATION BUILDING
31 TEMPORARY COLONY
32 CYCLIST & PEDESTRIAN WAYS
33 HOUSING AREA
34 EXISTING NANGAL DAM

Fig. 1.
Master Plan—New Industrial Township, Nangal.

Railway reservations excluding railway station and goods yard..	34.8 Acres
Residential area including roads, service lanes and small open spaces.....	952.5 "
TOTAL.....	2,941.0 Acres

Circulation

5. A rectangular system of roads was adopted for the township for economy, convenience, speed and continuity of circulation. The main north-south roads running with the slope have a gradient of only 1 in 60. The roads were deliberately planned to provide interesting rising and falling vistas of trees and houses, breaking the monotony of the straight streets, and also to allow for trunk-sewer and stormwater mains running economically with the north-south slope. Other factors governing the street pattern were the economy of orientation along a north-south axis for low income houses, and the avoidance of "unusable" pockets of land.

6. Since the largest proportion of the population will be workers in the lowest income groups, the bicycle is likely to remain the most general mode of transportation. For this reason cyclist and pedestrian routes have been carefully worked out connecting the factory, the town centre, the commercial and business areas and the railway station. The line of the existing 12-ft. Nangal-Hoshiarpur road which passes through the township (cutting diagonally across sectors 1, 4 and 5) has been retained in the plan to serve as one of the many express cycle-ways which have been designed independently from the motor road system.

The Town Centre

7. Covering an area of 72 acres, the town centre is located between sectors 1 and 2, near both the factory and the railway station. The north-south Central Avenue, which will have dual carriage-ways each of 33 ft., is expected to carry the main traffic as it connects the town centre with the factory and the rest of the industrial area. Designed around a chain of inter-related courtyards, the buildings of the town centre are designed to give a sense of urban continuity. The courtyards will be used for bicycle parking areas, playgrounds or resting places. There are six types of building use in the town centre: Administration, Culture, Utilities, Recreation, Commerce, and Shopping. With their inter-related functions, these groups of buildings have been designed as the civic centre of the township and treated as a "business precinct." Those having no specific business in the precinct can pass by this center of activity. Buildings of the centre have been set back considerably from the Central Avenue, and roads around the centre provide entries only at special points.

Industry

8. The factory is expected to produce 380.000 tons of diluted ammonium nitrate (containing 20.5% nitrogen) and about 14 tons of heavy water each year. Raw materials will be hydro-electric power from the Bhakra-Nangal Project, air, water and limestone. In full production, the factory will consume about 160,000 kw of power. Since the demand for power supply in the region is likely to be greater than the amount planned to be generated by the Bhakra-Nangal Project, it is not expected that other heavy industries will locate in the township. However, adequate provision has been made in the location of the industrial area so that expansion could take place without jeapordizing the development of the township.

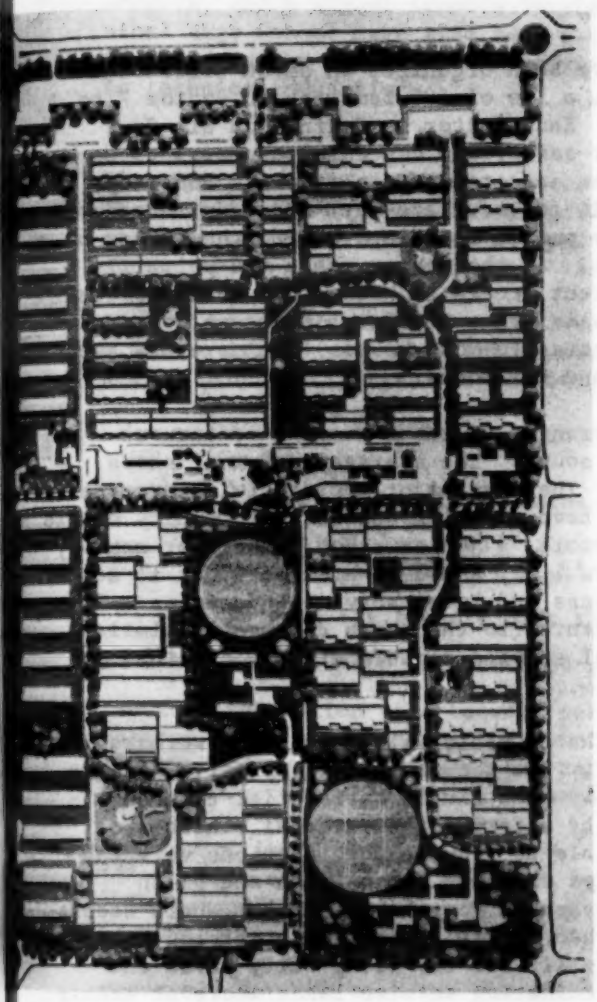


Fig. 2 **PLAN OF SECTOR 2**

This is a typical layout which explains the planning principles adopted in all the sectors at selected points only. Entries to the sector have been given. No direct access to the houses has been provided from the main Sector roads as these are primarily intended for fast vehicular traffic. For circulation of traffic within the Sector, a Circulatory Road has been introduced. Access to the houses has been provided generally by footpaths except where the length of a building block exceeds 250 feet in which case a cul-de-sac or a one-way road has been provided so that no house is at a distance of more than 300 feet from a traffic road. Although all the houses have north-south orientation, monotony has been avoided, by by careful grouping of houses around a chain in inter-related courtyards of variable sizes where the children can play freely without any traffic hazard.

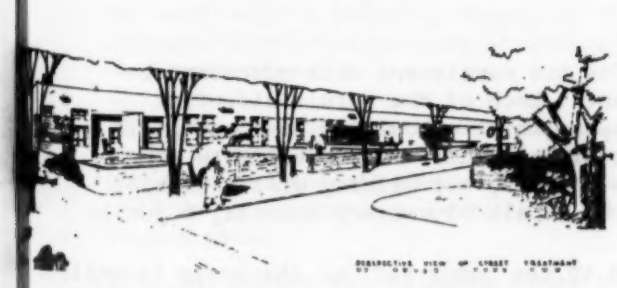


Fig. 6. Perspective view of Street treatment of House type I I.

Fig. 7. View from the Circulatory Road ; Houses for Industrial workers Sector 2.

Chowdhury, Jugal Kishan. Nangal, a new Indian industrial township. --3

Residential Area

9. Residential areas of the town have been organized in seven distinct sectors, with populations varying from a low of 500 families in sector 7 to a high of 2,000 families in sector 2. Each sector is defined on all four sides by important traffic roads. For safety and convenience, entry to each sector has been limited to eight or ten selected points at which bus-stops are located. A circulatory road (of 24 ft. carriage-way) has been introduced with easy access to the houses and the public buildings within the sector by means of the service roads or footpaths. As the sector roads are primarily intended for vehicular traffic, no direct access to houses has been provided from them. Moreover since the township is primarily for low-income workers, footpaths rather than roads provide access to most houses, but care has been taken to provide for any possible demand for roads.

10. Shops in each sector have been arranged in the form of a continuous shopping street running from north to south. The average number of shops provided in each sector is about 100. The five major sectors (with average populations of about 8,000) will also have a health centre, a community centre with a swimming pool, four nursery schools, a junior school, a higher school, and a temple or a Gurdwara. In sectors 1, 2, and 3 an area of about 11 acres has been provided for commercial business and local service industries. If the township expands further in the future (to the north and west), similar areas for commercial business and local service centers will be provided to the north within sectors 5 and 6.

11. The large majority of houses in the township will consist of workers' houses of Type I and II (see sketches). But a number of alternative designs have been evolved to remove the monotony of a single residential type and further variations have been achieved by altering the external finishes of the houses. Where it has been impossible to provide more than one verandah (for economic reasons) houses are always oriented north-south and given variably sized quadrangles as safe playspaces for the children. Where access paths to the blocks would be longer than 300 ft., roads with parking lots have been provided. Footpaths are normally 6-9 ft. wide, fully paved and surfaced. Savings were achieved by eliminating service lanes wherever access to the interior courtyard could be arranged without necessitating passing through any of the living rooms. Where this has not proved possible, a service lane of at least 8 ft., paved with bricks has been adopted. These are sloped to either side and can act as a self-cleaning stormwater drain.*

Education

12. The educational facilities provided are consistent with educational standards of the Punjab State Government. Each of the main residential sectors will have four nursery schools, a junior school for boys and girls and a higher school for either boys or girls. This will necessitate some exchange of the older students between sectors, but walking distances will not exceed 3/4 of a mile. There will be in all 23 nursery schools, 6 junior

*NOTE: The need for a separate access to the inner part of the house is still found necessary in India in view of long standing social custom.

schools, and 6 higher schools in the township. An Art College and a Technical High School have also been provided so that students can complete their education up to the Degree course in liberal arts and a Diploma course in technical education.

Health and Recreation

13. There will be 5 health centres in the township, one in each major sector. There will also be a general hospital with 100 beds located in sector 4 directly on the main east-west road which passes through the center of town, thus providing easy access from all quarters.

14. As stated, each of the five residential sector with a population of 8,000 to 10,000 will also have a community centre or club with a swimming pool. Other facilities of the township will be:

a. A workers' club or a welfare centre with a swimming pool and squash courts;

b. A staff club with swimming pool;

c. A boating club with a restaurant on the lake for aquatic sports like swimming, boating or fishing;

d. An open air theatre near the township centre;

e. A stadium to the north of sector 4.

The town recreation area between sectors 4 and 1 is designed to be used for various organized games by the town community. The buffer areas between the factory and the township and the park along the river bank and the lake with its parkway will also add considerably to the residents' amenities.

Public Utility Services

15. Public utility services such as water supply, drainage, sewerage, electricity and telephone are essential but costly features of the modern town. Economic considerations in the selection of the site included the availability of water (by being on the upstream side of the Nangal Dam). The fresh water reservoir for the town and the factory are located in the north of sector 4 on high ground--and the supply is aided by gravity. To economize on the costs of water purification, one or more intake wells with be constructed on the river bed to the right of the lake (together will necessary pump, filter houses and storage reservoirs). The water supply will be phased according to need, with a starting supply of 50 gallons per capita. The factory will consume 60 million gallons of untreated water per day, but it will have its own reservoirs.

16. The sewerage system for the township combines town sewage with factory waste in such a highly diluted state, that it will require no treatment plant. Drainage is generally excellent in Nangal, but sector 7 is on high ground and will use a septic tank system for sewerage. It will also require specially pumped water.

17. The advantages of being close to the power source and of purchasing power at bulk rates through the factor keeps the cost of lighting low. Progress construction of main roads is already in hand also of buildings in Sectors 1 and 2.

D.J.O.

Architectos Urbanistas Asociados (A.U.A.)
TUNJA: PLAN PILOTO 1958-1985
Bogotá, Colombia, April 1958, 81 pages. Illustrations. Original in Spanish
711.4 (86)

1. This is a pilot plan for a regional capital city in Colombia by Eduardo Mejia, Cesar Garces and Alberto Mendoza, (A.U.A.). It was published in collaboration with the Centro Interamericano de Vivienda y Planeamiento (Inter American Center for Housing and Planning), and the Instituto de Crédito Territorial of the Colombian Government.

The City in its National Setting

2. Of Colombia's major geo-physical divisions, the most highly developed is the Andina region. The eastern part of this region is the Plateau of Cundinamarqués-Boyacanse. The southern part of the plateau (the department of Cundinamarca) has as its natural capital Bogotá, which is of course also the national capital. Bogotá has industrial investment valued at some 450 million pesos. To the north, there are presently investments in metallurgy at Paz de Rio which are estimated to surpass 400 million pesos. The density of investment in these two centers produces two foci of maximum attraction within the region. The city of Tunja, capital of Boyacá Department in which Paz de Rio is located, is situated almost equidistantly between these two industrial center. This circumstance offers Tunja the possibility to transform itself into a center of processing and of intense distribution. But alternatively these two vast industrial centers could absorb all activity and cause the stagnation or even decline of an intermediate city like Tunja.

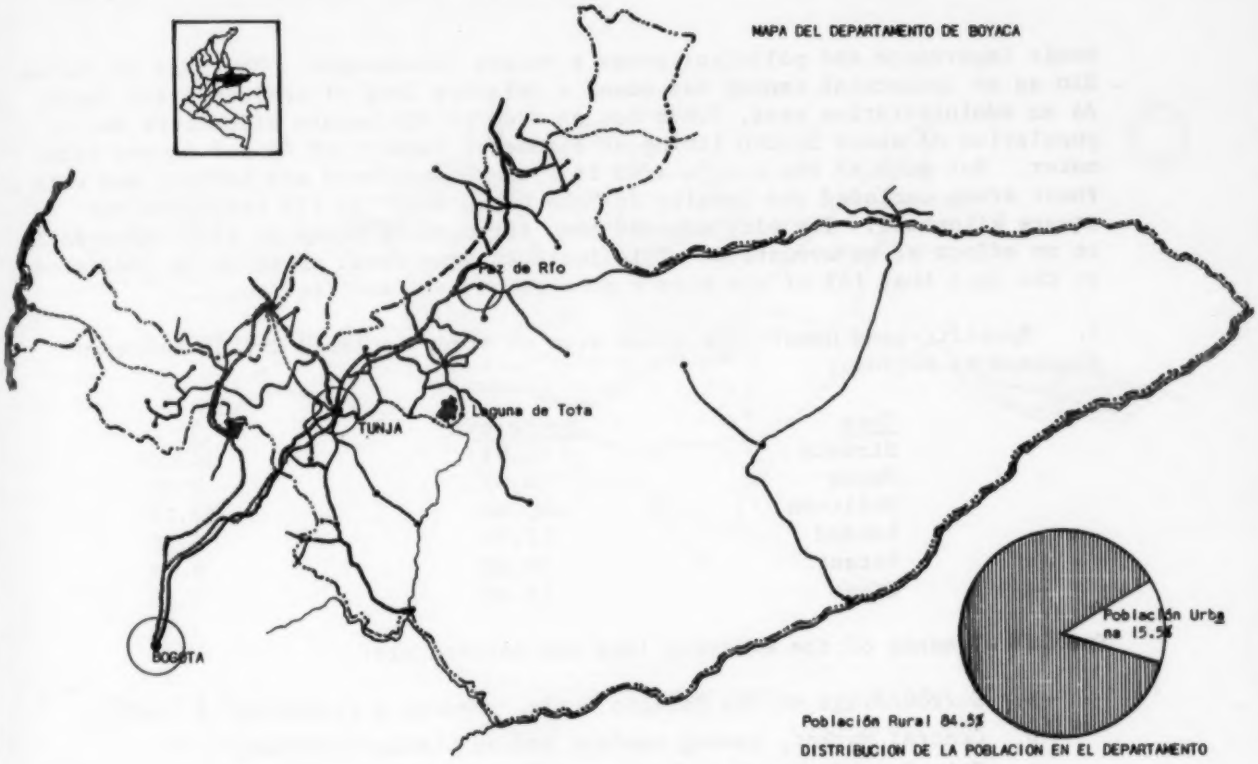
3. National transportation patterns are generally favorable to Tunja. The highway system, according to the plan of the Ministry of Public Works, consists essentially of two longitudinal north-south trunk routes connected by a series of transversals. The Eastern Trunk Route passes through Tunja, providing connections with most other cities, (but not Paz de Rio). The trunk route has cut the time between Tunja and Bogotá to two hours and has provided a flow of national and international traffic through the city. Railway ties with other points are equally favorable, and the main line between Bogotá and Paz de Rio passes through Tunja. The city is also guaranteed adequate electrical power. It is located in the central electrical zone, which has a potential for 50,000 million kilowatt-hours per year from hydro sources. With the construction of the line connecting Paipa and Bogotá (about 1960), Tunja will have almost limitless power.

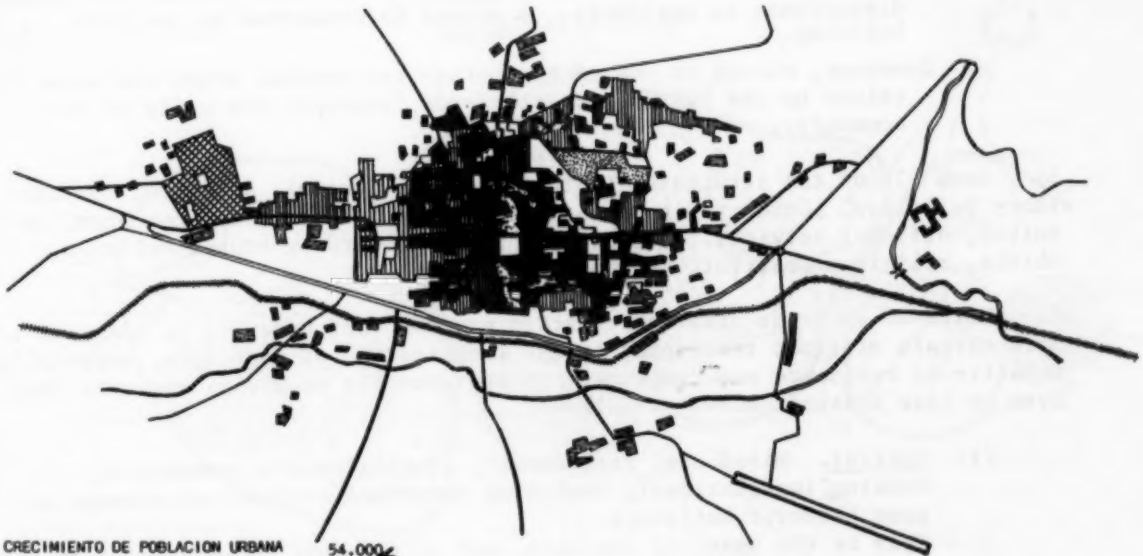
4. The Department of Boyacá, of which Tunja is the administrative and cultural capital, has a population of 806,000 spread thinly over nearly 62,000 square kilometers of area. Well over half of the population are illiterate, and almost 85% are rural. The annual per capita income averages 250 pesos--compared to a national figure of 550 pesos per capita per year. Four-fifths of the total value of production of goods and services in the department is related to agriculture, with most of the industrial activity in the metallurgical center of Paz de Rio.

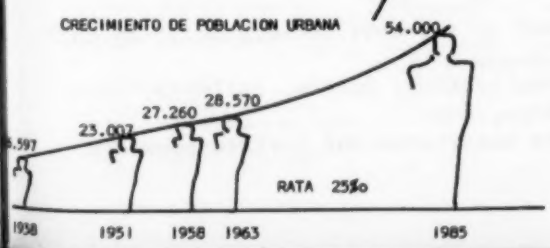
An Urban Inventory

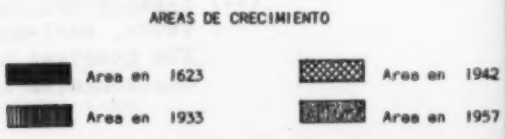
5. Tunja is located in the "Altipancie Central" of Boyacá, a rough group of valleys. More exactly, the city is set on a small plateau of poor, eroded soil in the cold and depressing valley of the Chulo River. Founded in 1539, Tunja has had a full history--with its decline in physical appearance, eco-

Architectos... Tunja: plan piloto 1958-1985









Architectos... Tunja: plan piloto 1958-1985. --2

nomic importance and political power a recent development. The rise of Paz de Rio as an industrial center has meant a relative loss of influence for Tunja. As an administrative area, Tunja has an area of 528 square kilometers and a population of about 50,000 living at a general density of 95 per square kilometer. But much of the city's area is sparsely populated and barren; and with these areas excluded the density of "the urban area" is 129 residents per square kilometer. The city annexed many surrounding towns in 1954, apparently in an effort at rejuvenation. This included many rural areas as is indicated by the fact that 18% of the city's population is classified rural.

5. Specific land uses: The urban area of study included 297.80 hectares disposed as follows:

Uses	Hectares	%
Streets	41.93	14.20
Parks	6.87	2.35
Built-on	185.40	63.27
Eroded	17.70	6.08
Vacant	32.62	9.60
Other	13.28	4.50

Special elements of the existing land use pattern are:

a. Surroundings of the Colegio Ortiz, needing a lessening of traffic
b. Central Market, having traffic and sanitation problems.
c. Fair Grounds and Slaugherhouse, located in a residential zone with disturbance to residents. A school is conducted in one fair building.
d. Cometery, placed in one of the better residential areas not maintained by the best health standards, disrupts the unity of the community.

6. Some 93% of the structures in Tunja are residential, and 82.4% are one-story buildings. Other major uses (in order) are collectives, commerce, industry, official services. Collectives include boarding houses colleges, hotels, religious institutions, hospitals and charity.

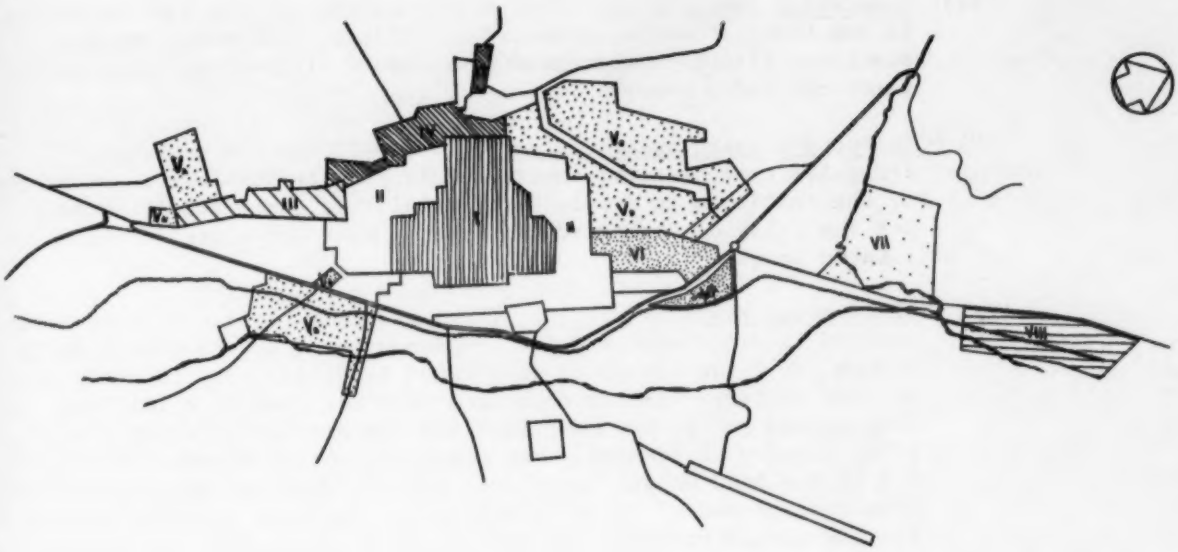
7. While an apparent disorder existsin present land uses, it is possible to note certain distinct tendencies in the localization of functions, especially relative to residence and commerce. It was possible to divide the city into more or less distinct zones as follows:

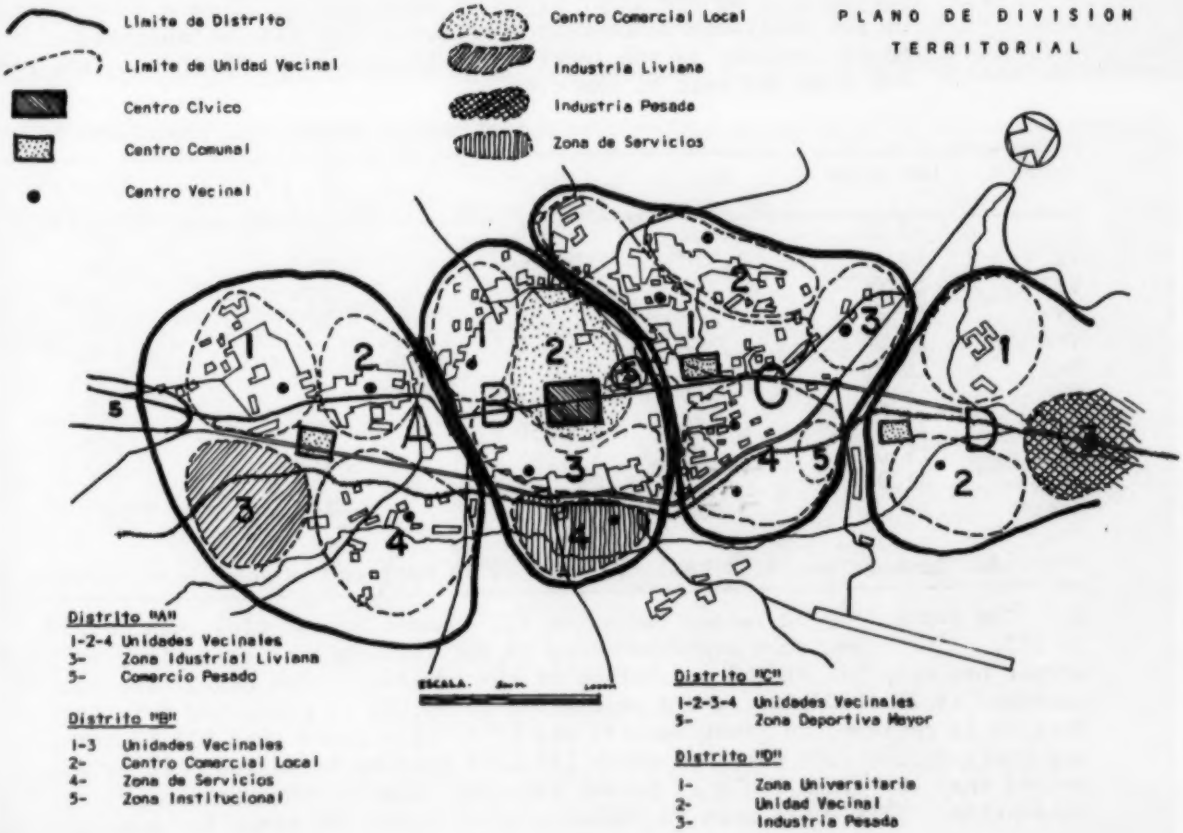
(I) Central. Mixed use, residential, administrative, commercial, banking, institutional, including important cultural structures and some historic buildings.
This is the heart of the city, and is the most densely built-up part.

(II) First order residential. Old construction, hotels, colleges, convents, asylums, schools, craftshops, etc.
The greatest number of collective structures and institutions are concentrated in this zone.

Architectos... Tunja: plan piloto 1958-1985

USOS GENERALES DEL TERRENO





Distrito "A"
1-2-4 Unidades Vecinales
3- Zona Idustrial Liviana
5- Comercio Pesado

Distrito "B"
1-3 Unidades Vecinales
2- Centro Comercial Local
4- Zona de Servicios
5- Zona Institucional

Distrito "C"
1-2-3-4 Unidades Vecinales
5- Zona Deportiva Mayor

Distrito "D"
1- Zona Universitaria
2- Unidad Vecinal
3- Industria Pesada

Architectos... Tunja: plan piloto 1958-1985. --3

(III) Commercial residential. This sector of the city is very defective. It has heavy commerce, industry, a college, factories, service stations, slight commerce and restaurants of lower quality. Some parts are badly eroded.

(IV) Second and third order residential. Dwellings are of a very irregular type, mostly constructed by private initiative and others by the Instituto de Credit Territorial. It has a school, hotels and the lands of the Aquaduct of the city. One historic church is located here.

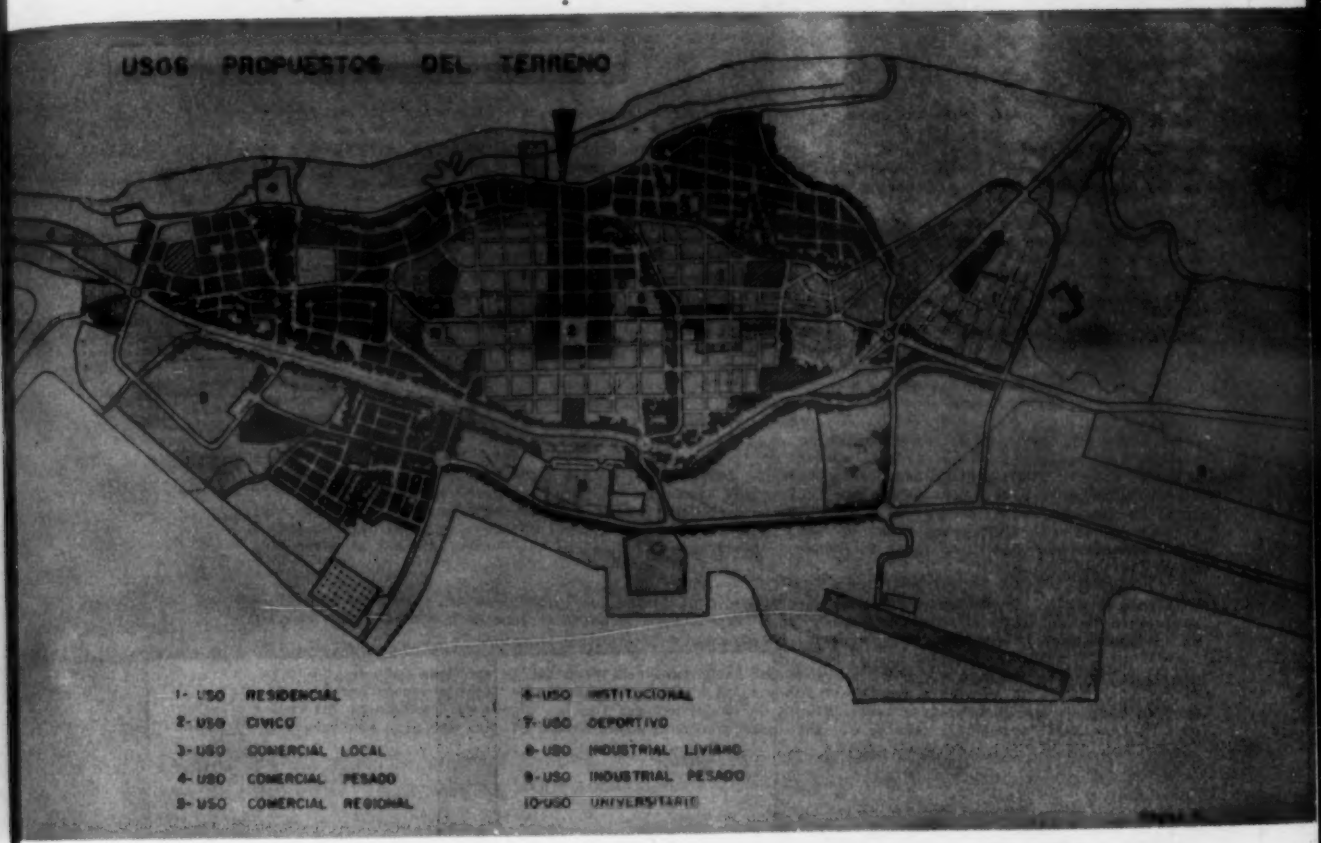
(V) Third order residential use. There are four sectors of this zone, located in different parts of the community. V-A is Barrio de la Picota. V-B has irregular and eroded land, few constructions and of poor quality. V-C is separated from the town by a long and deep eroded gully, has poor land and inconveniently steep streets, a low density of housing whose construction and appearance is poor. V-D is the most densely populated sector. Residences in parts are more ordered and of better appearance. Contains the Fair Grounds and the Slaughterhouse. In general it is reasonably and acceptably developing.

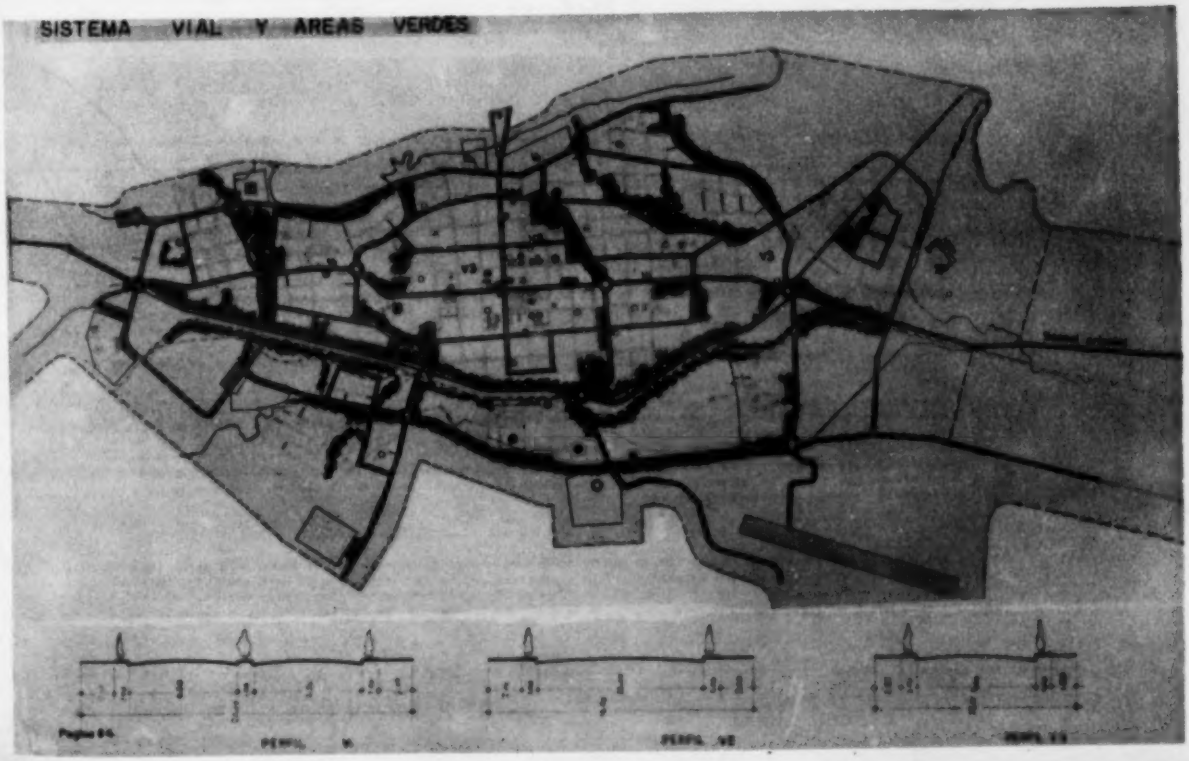
(VI) Residential of the first order in development. Here a development of the Instituto de Credito Territorial has been established. Major handicap is the location of the cemetery, which cuts the zone off from the rest of the city.

Zones	Hectares	No. Buildings	No. Inhabitants	No. of Dwellings	No. of Families
I	43.27	1,082	7,370	852	852
II	63.29	1,330	8,800	1,270	1,465
III	13.90	139	950	134	160
IV	17.69	266	1,815	226	300
V-A	14.84	89	610	86	100
V-B	20.85	83	565	83	95
V-C	34.92	244	1,662	244	280
V-D	28.04	504	3,430	502	570
VI	19.03	162	1,103	160	185
Hosp. etc*	41.97	3,900	255 26,560	3,557	4,007

*Includes Cemeteries (4.03 ha.), Vacant (30.23 ha.) and Highway zone (5.08 ha.)

8. The population of Tunja, including all annexed communities, was 44,250 in 1951. The urban zone contained only 23,007 residents at that time; so Tunja proper had only 52% of the population of the administrative unit. The rate of increase is 25/1000/year, and a population of 54,000 is projected for 1985. Housing is reviewed in great detail; and it is calculated that 133 families are newly formed each year, of which 120 will need to be housed. It is suggested that the state build 25 houses per year, leaving the rest to private enterprise. This would mean an expenditure of 8,400,000 pesos for housing


USOS PROPUESTOS DEL TERRENO
1- USO RESIDENCIAL
2- USO CIVICO
3- USO COMERCIAL LOCAL
4- USO COMERCIAL PESADO
5- USO COMERCIAL REGIONAL
6- USO INSTITUCIONAL
7- USO DEPORTIVO
8- USO INDUSTRIAL LIVIANO
9- USO INDUSTRIAL PESADO
10-USO UNIVERSITARIO


SISTEMA VIAL Y AREAS VERDES

Architectos... Tunja: plan piloto 1958-1985. --3

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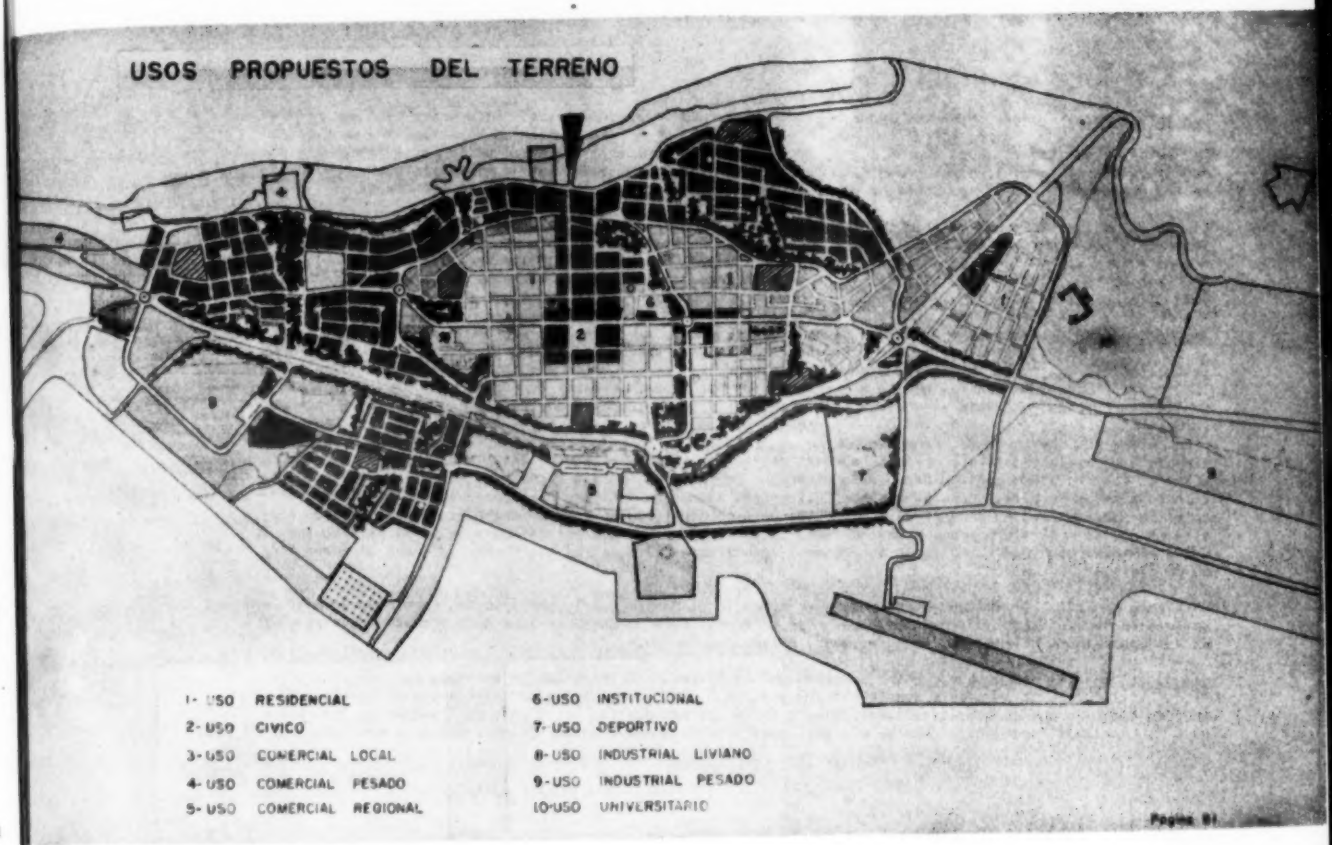
USOS PROPUESTOS DEL TERRENO
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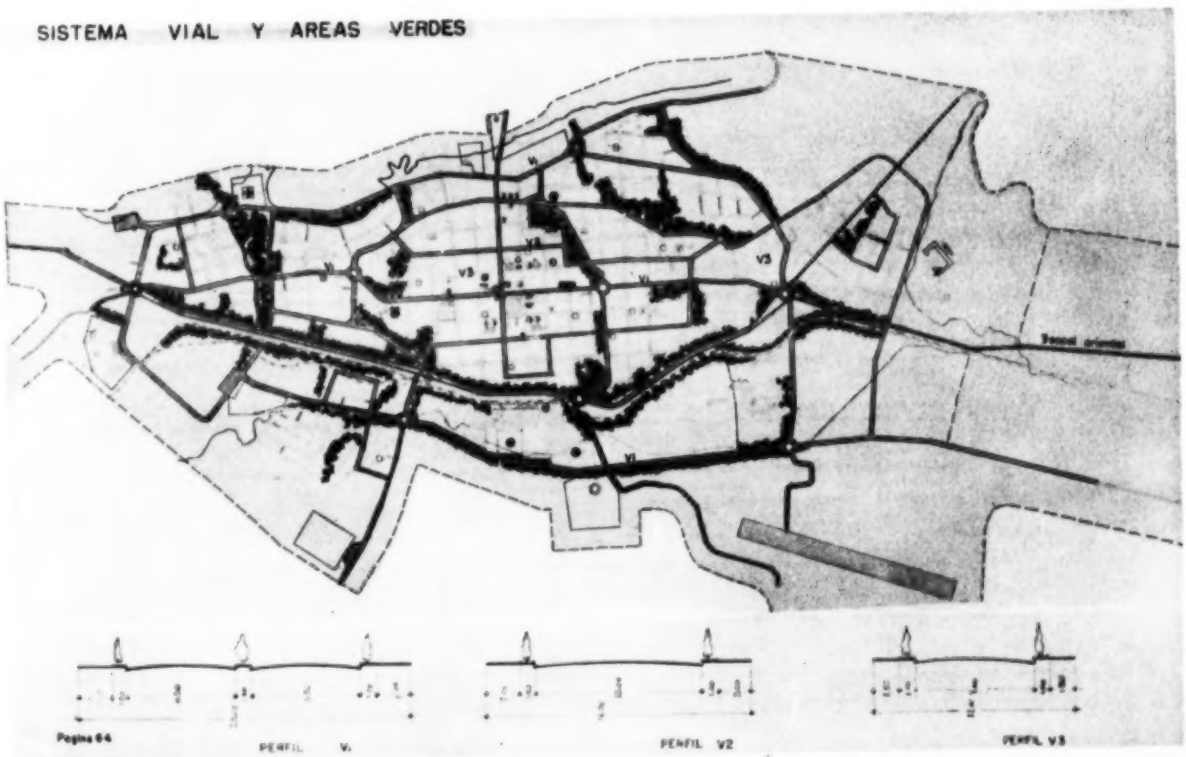

SISTEMA VIAL Y AREAS VERDES
PERFIL V1
PERFIL V2
PERFIL V3

over the next 27 years. For primary and secondary education, a larger amount will be required during the same period -- 9,500,000 pesos. This does not include university training, which is handled at the national level. Tunja will need a water purification plant and three new health centers, which will cost 600,000 pesos. The water purification plant will be combined with an aquaduct, which has already been authorized, at a total cost of 6,985,000 pesos. A new sewage system is needed, and it must include a sewage treatment plant; for untreated combined sewage is now dumped in the Chulo River. Total cost will be 6,515,000.

9. Utilities such as telephones and electricity are reviewed and the costs of wider application estimated. Special attention is given cleanliness and sanitation in the city. The market needs enlarging and better traffic control, it now produces an annual revenue of 290,000 pesos. The construction of three new markets, at a cost of 600,000 pesos is suggested. The Fair Grounds and the Slaughterhouse are in good condition but poorly located. They will both have to be moved during the coming years, for their own advantage as well as for that of the city; and the cost will be about 1,000.000 pesos. More than half of the streets in Tunja are in poor condition, many eroded and rutted. They make up 14.2% of the total land area of the community.

The Plan

10. For the year 1985, it is expected that there will be the following income distribution of families, with the following residential land needs:

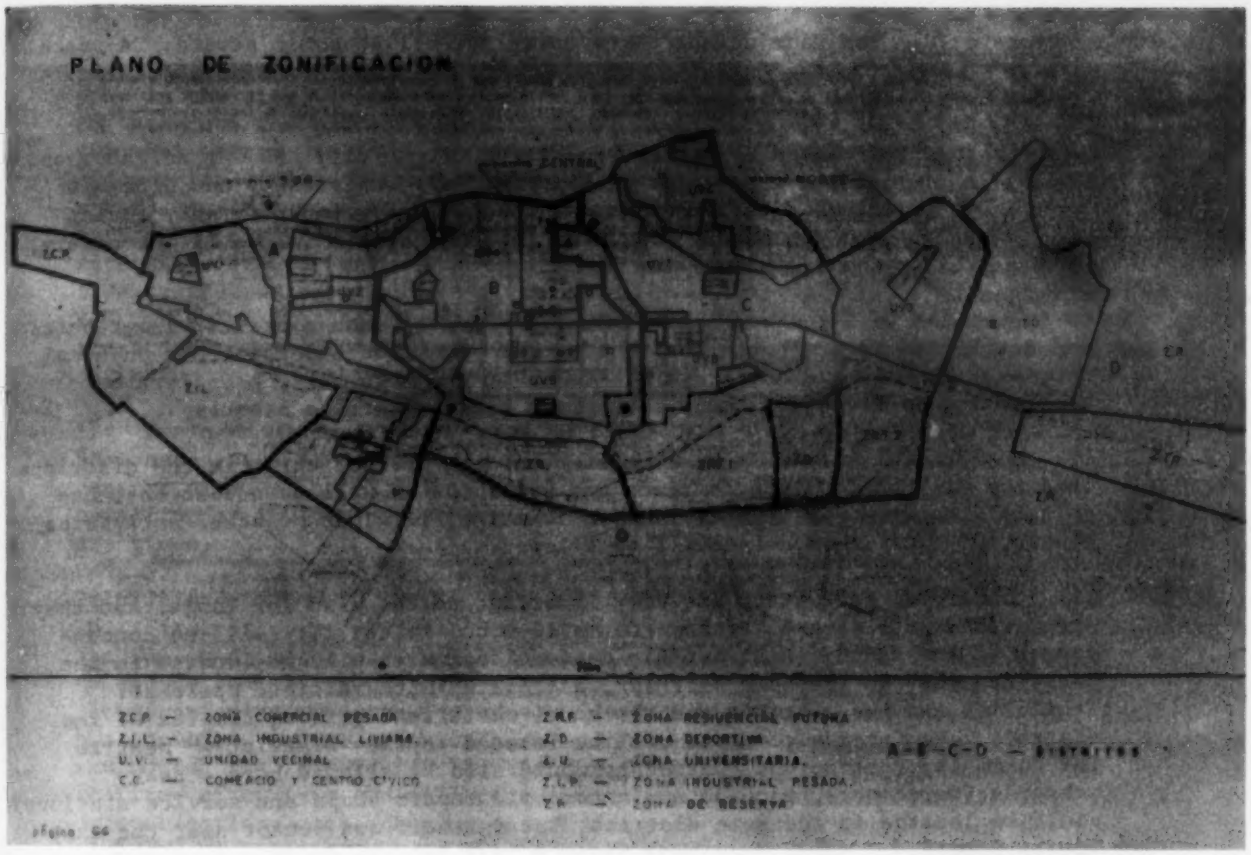
Income	No. of Families	Density/ha.	No. Hectares
High	1,473	20 (fam)	73.65
Medium	2,025	25 "	81.00
Low	4,617	30 "	149.50
	8,113		304,15

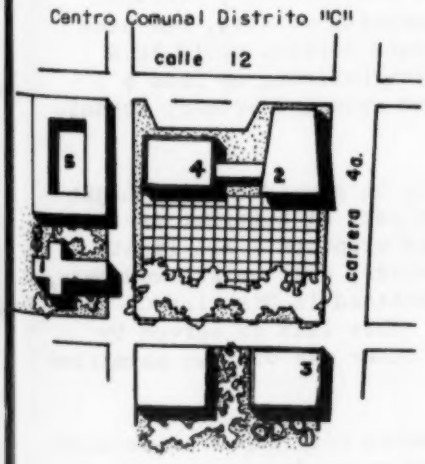
This means that Tunja will need 304.15 ha. in 1985 for residential purposes alone, while the present urbanized area has a total of only 297.80 for all uses. This will require extending urban development into some outlying areas. Administratively, the plan divides the land area of Tunja into four large districts.

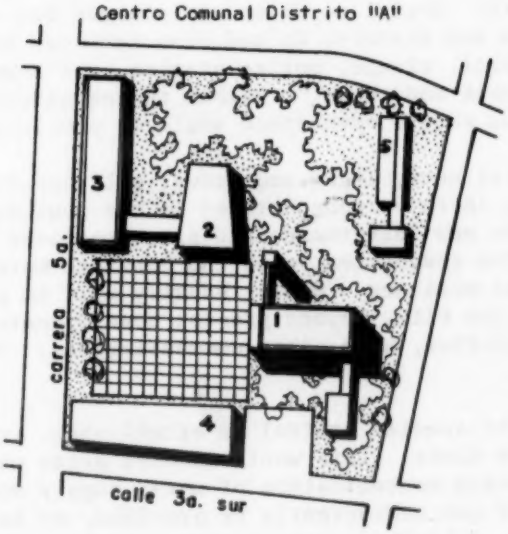
District A. Includes residential sectors of limited inhabitant resources. It is divided in 3 neighborhood units each with its respective neighbour center. There is an area for light industry and dense commerce and a central space is provided for the community center.

District B. Constitutes the center of the city with the civic center, the most important zone of commerce, the main institutional zone and two neighborhood units for high income inhabitants. At the eastern part, past the railroad tracks, a zone for warehouses etc. is suggested to facilitate regional trading. The market place, bus terminal and a new railroad station with facilities for commerce, hotels and restaurants are also included there.

Architectos... Tunja: plan piloto 1958-1985


PLANO DE ZONIFICACION
Z.C.P. — ZONA COMERCIAL PESADA
Z.I.L. — ZONA INDUSTRIAL LIVIANA
U.V. — UNIDAD VECINAL
C.C. — COMERCIO Y CENTRO CIVICO
Z.R.F. — ZONA RESIDENCIAL FUTURA
Z.D. — ZONA DEPORTIVA
A.U. — ZONA UNIVERSITARIA.
Z.I.P. — ZONA INDUSTRIAL PESADA.
Z.R. — ZONA DE RESERVA
A-B-C-D — SECTORES





LEYENDA:

1.- Iglesia
2.- Teatro
3.- Mercado
4.- Centro de Salud e Inspección dé Policía
5.- Escuela.-

Architectos... Tunja: plan piloto 1958-1985 --4

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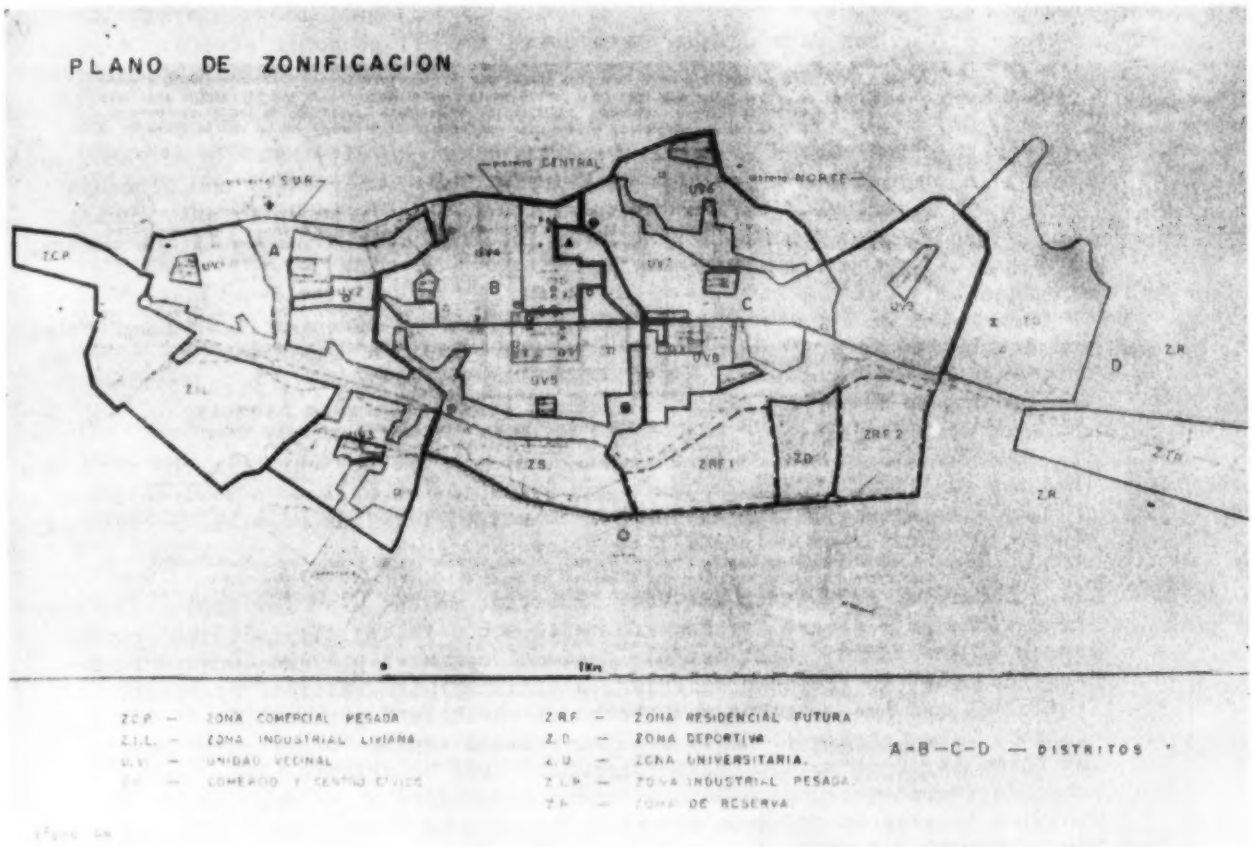
Low	4,617	30 "	149.50
	8,113		304,15

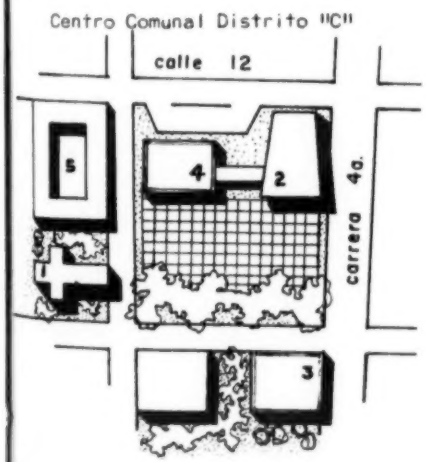
This means that Tunja will need 304.15 ha. in 1985 for residential purposes alone, while the present urbanized area has a total of only 297.80 for all uses. This will require extending urban development into some outlying areas. Administratively, the plan divides the land area of Tunja into four large districts.

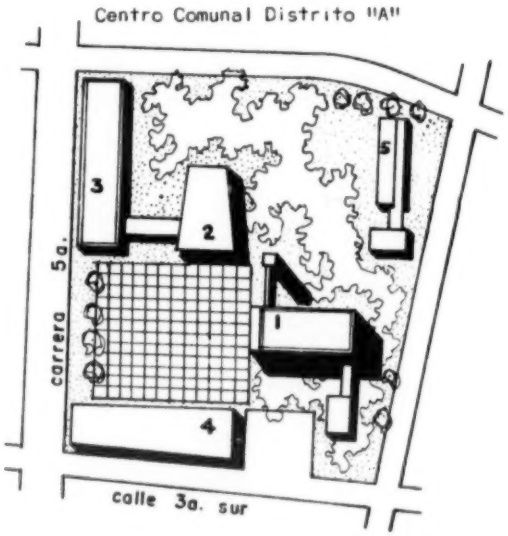
District A. Includes residential sectors of limited inhabitant resources. It is divided in 3 neighborhood units each with its respective neighbour center. There is an area for light industry and dense commerce and a central space is provided for the community center.

District B. Constitutes the center of the city with the civic center, the most important zone of commerce, the main institutional zone and two neighborhood units for high income inhabitants. At the eastern part, past the railroad tracks, a zone for warehouses etc. is suggested to facilitate regional trading. The market place, bus terminal and a new railroad station with facilities for commerce, hotels and restaurants are also included there.

Architectos... Tunja: plan piloto 1958-1985







LEYENDA:

1.- Iglesia
2.- Teatro
3.- Mercado
4.- Centro de Salud e Inspección de Policía
5.- Escuela.-

Architectos... Tunja: plan piloto 1958-1985 --5

District C. Has four neighborhood units for all economic strata. A space for the installation of sports buildings such as a stadium. Also a fire station.

District D. Situated at the extreme north of the city has one neighborhood unit for families of high incomes. University and other institutional buildings are found. Heavy industry and, facing the University zone, the railroad station where, if necessary, the warehouses can be enlarged.

To ensure the best control and characterization of each district, geographic and artificial determinatives were sought to constitute perceptible physical unities. To this end advantage was taken of the main river beds left by erosion and to transform these into green betls with tree planting.

11. Residential uses will be localized in neighborhood units in the districts. This use will admit minor commerce and workshops as well as educational and cultural centers. No industry, major commerce, services or other activities generating traffic or noise will be allowed.

12. Commercial activities are very important to the plan for Tunja, and they are divided into several types. Commerce local to the city will be concentrated in the center (District B); regional commerce will be located in the "service zone" in the same district, associated with railroad passenger facilities and bus stations and the hotel-restaurant-parking complex of the district. Semi-heavy commerce will be located in the "District A" next to the Community Center, and apartments would also be allowed here. Heavy commerce (warehouses, machine and automobile repair shops and service stations) would be located in the same district, but in their own sector near the exit toward Bogotá.

13. Civic uses would be both centralized and localized. A Plaza de Bolívar is planned in the center of District B, with many of the community services worked into it. Social services are planned for community centers, one each in District A and District C; and also included in such centers would be a church, a school, clinic, police station, and commerce, building up into a "plaza de market and shops." Within the neighborhood units, a primary school, play field and public open space would be provided.

14. Industrial uses, light and heavy, will hopefully be provided for. Light manufacturing is to be concentrated in the southeast part of District A--near where the new fairgrounds and slaughterhouse are proposed. All light and non-problem industries, plus the heaviest warehouses, will be allowed here, but residences will not. Heavy industry will be permitted in District C, to the north of the city, beyond present developments. This land is served by the rail facilities, with other communications. No other use will be permitted in this area.

15. An area of special control is established, in which only approved developments can take place. This would involve areas where urban development would be harmful, where contamination of water supply would be a danger, where services could not conveniently be provided, or for some other good reason. In some cases, a limited agricultural activity could be allowed in such areas--

effectively preserving them as green spaces.

16. The street system proposed seeks to provide for rapid movement to any spot in the city, to make effective the districts and zones proposed, and to integrate the national Eastern Trunk Route with local circulation. The national artery, called "Autopista" runs parallel to the railway, and is proposed as limited access. Regional communication routes, with the national artery as a focus, should form a system of radials from Tunja. The urban system proposed consists of three classes of streets: V-1, which will separate districts, of which there will be three North-South longitudinals and five transversals; V-2 streets, which will serve as auxiliary to V-1's; and V-3, which will be local streets not served by rapid transit. Parking lots are proposed in several places of importance in the city. Pedestrian ways are set aside in the neighborhood units and along the Autopista.

17. A non-cumulative zoning plan is worked out, to implement the land uses proposed. Details developed are the civic center, two district community centers, remodeling of a housing block, remodeling of a quarter. Costs, totalling 49,450,000 pesos, are also detailed. Some ideas for implementation are given.

Priorities.

18. First priority projects, to be realized during the next 5 or 6 years, are the following: the aquaduct, the sewage system, moving the cemetery, and telephone installations. The total of these projects is 19,700,000 pesos. Second priority projects include: moving the market to the Service Zone, the bus terminal, construction of small markets in the districts, health centers, and moving the fairgrounds and the slaughterhouse. These works should be realized after 1964 and will cost about 3,950,000. Third priority projects, or accessories, are: development of a sports zone, an installation for firefighters, a theatre in open air, a water treatment plant, and the canalization of the Chulo River--projects which would total 4,000,000 pesos. Ongoing projects include housing, schools, open spaces and streets, with an annual cost of about 1,090,000 pesos.

A.D.H.M.O.

Chatterjee, S.P.
PHYSIO-ECONOMIC BASES OF REGIONAL PLANNING IN INDIA
Prepared for submission by East Asia Regional Organization for Planning and Housing (EAROPH) to the United Nations Seminar on Regional Planning, Tokyo, 1958.
711.14 (540)

1. This study was undertaken on the request of EAROPH to indicate India's views on regional planning and the delineation of regions. Advantage was taken of the progress of a national atlas depicting physico-economic factors on a national basis. Dr. Chatterjee is Head of the Department of Geography, Calcutta University and also Director of the Government of India's National Atlas Organization.

2. Physio-Economic Bases. If regional planning is to succeed, a region has to be demarcated carefully and its physical bases have to be analysed and then plotted on large scale maps to show their inter-relationships. An attempt should then be made to synthesise these elements. Only when this has been done can the sum total of their effects on man's activities be properly assessed, and subsequently modified on a planned basis.

3. India is a vast country with varied types of relief, climate, soils and drainage. These differ so much from region to region that too much reliance on sample surveys and statistical methods might not provide the sort of data needed for an all-round development of the nation. The publication of the National Atlas of India, incorporating a number of maps to the same scale, presents a great opportunity to demarcate macro-regions of India for the purpose of planning.

4. Location of Villages and Towns. The great size of India, some 810 millions of acres, is a problem of regional planning itself. And this is the more complicated by its vast population, numbering some 360 million. This vast population lives and works in some 3,000 towns and 600,000 "revenue villages", which comprise about 1,800,000 real villages. A correct location of these villages and towns (for which population figures were obtained at the 1951 census) is being shown on quarter-inch maps by the National Atlas Organization. These maps, when completed, will be made readily available to regional planners. It is true that broad facts about the distribution of these settlements are already known; but there is enough variation within known general areas to warrant a detailed analysis before regional planning can be undertaken.

5. A map showing the location of villages and population in the Orissa Region for example, shows that there are three population belts running more or less parallel to the coast. It is also clear that the three belts do not have the same densities of population, and further study is here called for. Similarly, it has been indicated that the Chilka coastal region is distinct from the Balasore coastal tract. In the former, development must follow reclamation of a marshy barrier; and in the latter, where settlements are in depressions of sand dunes, the advance of sands must be blocked through afforestation. In another case in Murshidabad (a deltaic district of West Bengal) the Western Rarh region is more sparsely populated that the Western Bagri region--and the villages still cling to the abandoned river courses, such as those of the Bhairab.

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6. Relief and Structure, their Influence on Crop Distribution. In a tropical country, it is the hills, mountains and plateaux with their varying altitudes which determine the climatic habitats of varying flora and fauna. These distinguish one region from the other. To establish such regions, elements such as degree of slope, soil, types, drainage conditions, amount of soil erision, degree of stoniness and amount of rock exposure need to be carefully noted on large scale maps. A knowledge of lithological and structural characters of exposed and underlying rocks is also essential, as that can determing the availability of water and minerals, essential for both town and country planning.

7. In South India, the Palni and Cardamom hills cover an area of about 1,000 sq. miles and rise to over 8,000 ft. These hills are quite suitable for growing plantation crops like tea, coffee, rubber and cardamom, provided the requirements of each crop are carefully studied and steps taken accordingly. But an unplanned system of plantation prevails there at the moment; trees are felled indiscriminately and land is put to use without much tillage, irrigation, manure or rotation of crops. Coffee and other plantations crops are grown for a period of 15 to 20 years and then the land is abandoned. It is well known that coffee thrives better when it is sheltered from strong winds and gets about 80 inches of rainfall in an open and bracing climate of hills of 3,000 ft or above. The slopes of hills are also suitable for growing coffee, as the root structure of coffee plants has a tendency to bind soils, thereby preventing soil erosion. The growing of banana trees on hill slopes, does not resist erosion, and should be avoided. Cardamom needs greater rains and does not thrive well on hill slopes. Thus there is considerable scope for the extension of cardamom plantations in the higher elevations which receive rains from S.W. Monsoon, provided such areas can be made accessible by improving the road system.

8. Climate. Rainfall and temperature are of the utmost help in delimiting regions. No attempt has yet been made in India to determine the rainfall types based on the ratio of wet months to dry months, as has been done in Indonesia. Such a study would aid in developing agriculture and forest wealth. A study of the distribution of the aridity index in India, based on de Martonne's formula, reveals that in South India there is a region with a 15 or less aridity index, lying just to the West of Kurnool and occuping an area of about 12,000 sq miles. This is the driest region in South India and should be given first priority in any irrigation scheme that the Government might initiate in the future. Second priority should be given to the Kurnool-Sholapur region which covers an area of 70,000 miles and has an aridity-index of 20 or less. The waters of the Bhima, the Krishna, the Tunga-Bhadra and other rivers should be utilised for developing agriculture in these parts of South India. This region presents, in many parts, a bleak treeless appearance consisting of long low grassy uplands suitable only for sparse pastures.

9. It may also be necessary to divide India into climatic regions. The distribution of climatic types based on Koppen's formula is well-known. Generally speaking a tropical type of climate with high temperature and a distinct dry season either in summer or in winter prevails in South India, whereas in the eastern part of North India tropical rainy climates prevail; and in the western part of North India there are dry climates. There are several modifications of these types, the precise boundary of each of which is to be drawn on large scale maps.

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10. Soils. Soil classification and mapping have not yet been attempted on a large enough scale to be of use in agriculture planning in India. It is known that there are four main soil types: alluvial, black, red and lateric. The alluvial group is the most productive and extensively distributed over the deltaic parts and the Ganges and Brahmaputra plains; the black soils occupy northern and central parts of the Deccan plateau and are suitable for cotton cultivation; the red soils occupy southern parts of the Deccan Plateau and are of medium to low fertility; and the lateritic soils, capping various kinds or rocks, can support only sparse vegetation. There are important variations locally within these general soil classes.

11. A land-capability survey on the lines adopted by the Soil Conservation Service of the USA is needed to furnish enough data for making fuller use of soil resources. This allows the mapping out not only of ground slope stoniness and degree of erosion, but also the effective soil depth, the thickness of the upper humic layer, the distribution of hard pans or gravel layers, water tables and other mappable features. Surveys of this kind prepared earlier revealed important small-scale features of the soils of Bengal.

12. Rivers. The conservation and utilisation of water constitute a major problem in regional planning. Of 1,356 million acre feet of total run-off in India, only 76 million acre feet (just over 5%) of the water resources of the country are being utilised at the moment for irrigation and power generation. We have corresponding figures for each of the major river valleys, but not on a regional basis. The discharge of every stream should be taken into account in regional planning. Along the Tambraparni, a small river, flowing through one of the driest yet most densely populated regions of South India, it is necessary to take measures to use all available flow--plus water diverted from neighbouring catchment basins on the Western Ghats. In west Bengal most of the rivers are dying, and creating many problems for regional planners. The Bhagirathi (which passes through Calcutta) is one such river, but the Bhairab-Jalangi and the Matabhanga are no better off.

13. Land Use Survey. The degree of response of crops to physical conditions can only be revealed if a land use survey of the country is undertaken. Land has some use to all individuals, in towns as well as rural villages. One land use study has been carried out for some Bengal villages. The area of this study adjoins the city of Calcutta and is one of the most densely populated rural areas of the world. There are between 1000 and 7000 persons per square mile some among the areas depending on accessibility from Calcutta or the development of factories within the area. Under these conditions there has been much abuse of the land and farming has been neglected. The twin evils of flooding and waterlogging of these areas are other problems. Lands are underused due to the extreme fragmentation of soil types, water shortage during winter months, and (in the southern part) danger of saline tidewater in canals and rice fields. The indications are that, even in a region having a high man-land ratio, land is not put to its maximum use. Well-drained arable land near greater Calcutta is being permanently lost to agriculture where other uses are encroaching on farming. Road systems are also defective from the point of view of the farmers.

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14. Another region of study lies to the south in the southern part of the Western Ghats. Consisting mainly of granitoid gneiss, this region is subject to considerable erosion because of excessive heat and humidity. Luxuriant tree vegetation is supported by deep residual soils, now somewhat leached.

15. Delimitation of Regional Boundaries: Relief, geology, rainfall, soils, forests, rural-population and food crops.
Using the maps published in the National Atlas of India (1957), an attempt has been made toward delimiting the regions of India. Isolines were drawn for each of the seven regional components selected and then all these lines were superimposed on one map of the same scale. Based on the boundary trend lines, the following regions were delimited:

The Himalayas
The Meghalayas
The Hind Plains
The Northern Plateaux
The Southern Plateaux
The Western Ghats
The Coastal Plains

Each of these regions were further subdivided into divisions, and then divisions into zones, which can be further subdivided into sections. Wherever possible, each section can then be subdivided into units, which will be the smallest areas in the selected hierarchy. Sectional and unit delineation will await more detailed regional maps.

16. The Himalayas. High relief, complex geological structure and rock types, and rich sub-tropical temperate and alpine flora clearly make this region stand out on a map of India. It has been further subdivided into two divisions, based mainly on precipitation: the Eastern Himalayas and the Western Himalayas, separated by the Central Nepal Himalayas. The Eastern division is more humid and thus has richer, denser tree vegetation and is a more difficult area for human habitat. The whole region lacks railways and has scarcity of good roadways and waterways. There is only limited scope for irrigation, with the sparce rural population occupied mainly in the cultivation of cereal crops. This mountainous region is the least developed part of India, having almost no urban population, manufacturing activity nor power resources. The Western Himalayas has been divided into two distinct zones based on rainfall and natural vegetation:

a. A heavily forested rainy southern zone, and

b. Drier northern high plateaux and mountains with alpine vegetation.

Characteristic of the two zones are the Kashmir vale and the Ladakh plateau respectively.

17. The Meghalayas. The rainiest region of India lies to the south and east of the Brahmaputra plains, and it has been called the Meghalaya because of its cloudiness during most of the year. The trends of relief contours and vegetation lines also set off this region from neighbouring plains. The two divisions of the region are:

a. The Shillong plateau
b. The northeastern hills.

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18. The Hind Plains. Low relief, rich fertile alluvial soils, and high rural population density give a prominant character to this region. It includes the Brahmaputra valley in the east, but only part of the Indus plains in the west. The Rajasthan plains are also included in this region. Based on rainfall, distribution of crops and density of rural population, the northern plains were divided into these divisions.

a. Brahmputra Valley Plains,
b. Ganges Delta,
c. Lower Ganges Plains,
d. Middle Ganges Plains,
e. Upper Ganges Plains,
f. Sutlej Plains,
g. Rajasthan Plains and Culth dry plains.

The Sutlej Plains are the most distinct of these divisions, which otherwise tend to blend into one another at boundaries.

19. The Northern Plateaux. A complicated pattern of trend lines in the components used indicates an internal diversity in this region. Divisions are Western, Central and Eastern. The Central division corresponds to the central India mountains and plateaux. The Eastern division includes most of the Eastern Hills, with the Dandakaranya area a special zone within the division. Other zones in the Eastern division are the Chattisgarh Plain, the Eastern Ghats and the Orissa Hills. Zones in the central division are the Chofanagpur plateaux, the Maikal Hills and Satpuras. The Western division can be divided into the following zones: the Kathiawar Uplands, the Gujerat Plains, the Aravallis, the Bundelkland Hills, the Malwa Plateau, and the Windhyan Scarps.

20. The Southern Plateaux. This is the most homogeneous of the Indian regions. Yet it can be subdivided into the following regions on the basis of relief and geology: the Northern part country; the Central country, which is typical granitic; and the Southern, which is modified granitic topography traversed by long ridges. The Southern division is higher and thus somewhat cooler than the other two divisions. The Northern division is cut by longitudinal zones, the Western and the Eastern. The Central division is more complicated and has three zones, the Western, the Eastern and the Cuddapah. The Southern division is noted for generally uniform conditions throughout, for four zones have been set off: Dharwar, Bongalre, Coorg, and Tamiland.

21. The Western Ghats. The boundary lines for the selected criteria either run parallel or coincide for this region. They indicate a rapid change in a vertical direction and an apparent homogeneity for the region.

22. The Coastal Plains. Well differentiated from the adjoining inland plateaux, these coastal plains are flanked by a boundary girdle on the inland side. (The 'boundary girdle' consist of a close intertwining of boundaries for several of the regional criteria.) The region has been divided into divisions, Eastern and Western. The Eastern division is in turn divided into two zones, the Deltaic and the Non-Deltaic. Similarly, the Western division is divided into two zones (based on crop association) the Kinkan and the Kerala plains.

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Editors Note: The method of geographic regional delineation described here has several well known antecedents. Among the more significant efforts to delineate regions on a national basis are those of Otremba in Germany, Lee for the China mainland and Windler for Switzerland (the last named being somewhat pretentious mathematically). A neat and relatively simple graphic method of regional demarcation was developed several years ago by the Finnish geographer, Granö. For a fairly up-to-date summary of work in this field since 1940, see Cyril Aubert, "La Situation Actuelle des Recherches sur la Délimitation des Régions Géographiques," Geographia Helvetica 10: 2 (January 1955) pp. 95-100.

D.H.M.O.

Prasad, V.N.
CONSERVATION OF PHYSICAL RESOURCES IN REGIONAL DEVELOPMENT
United Nations, Economic and Social Council, Seminar on Regional Planning, Tokyo), Working Paper no. 5. 6 August 1958.
711.2 (100)

1. This working paper from the Tokyo Seminar on Regional Planning deals with the heart of regional planning--natural resources. Drawing from a wide experience in the field, the author has made several important suggestions regarding the conservation of natural resources in developing countries. V.N. Prasad is now head of the Department of Architecture, Indian Institute of Technology.

2. The material aspect of civilization, which makes possible and supports the "spiritual" civilization, has not been created from human effort alone. It has been constructed by people out of natural resources: lands, waters, minerals, etc. Perhaps more important is the fact that material civilization today is maintained by the ceaseless exploitation and reshaping of these natural resources. Thus modern civilization presents a picture of man dependent on machines, which in turn feed upon resources provided by nature. Such a system must necessarily collapse if its foundation of natural resources is depleted or allowed to fall into disrepair.

3. The apalling conditions that can be brought about by misuse of natural resources are evident everywhere: floods, droughts, soil erosion, land exhaustion, water pollution, destruction of valuable fish and wildlife. Until recently advocation of conservation has been sporadic, but now a programme for conservation goes beyond the original ideas of mere protection of natural resources. It implies their wise and wasteless use, not a state of unproductive idleness. And this requires a planned use of resources--thus injecting the planning motif into the concept of conservation.

4. In most of the countries of Southeast Asia (except Japan) the exploitation of natural resources has not yet reached severe depletion of any magnitude. India, for example, which is only beginning her bold development programmes of industry, agriculture and other aspects, has most of her resources still intact. The underdeveloped countries can learn lessons from the experiences of more developed countries in the ruthless exploitation of resources. Of course, there has been waste of some resources in countries like India, which is evident in eroded land, thinning natural cover, vanishing wildlife, etc. But severe depletion has not yet resulted in the field of mineral resources, for these has been no well-developed mineral industry in the country.

5. Proper measures of conservation are now overdue in the underdeveloped countries, and there are two ways to effect this:

a. Legislation and government control imposed from above, or

b. Education and voluntary cooperation developed from within.

Actually, conservation should be approached from both ends. Natural resources are usually grouped as soils, waters, forests, wildlife and minerals. Though the conservation measures which can be applied to each of them are not identical, certain general principles of conservation are universal and may serve as planning criteria.

Prasad, V.N. Conservation of physical resources in regional development --2

(I) Criteria of beneficial use. Natural resources are for the benefit of society, and any control or conservation of such resources places upon the owner and obligation to use them beneficially and with minimum waste.

(II) Criteria of variability of waste. Wastage in production or consumption may have to vary to some extent when the factors of production are out of balance or adequate physical distribution is not possible, but deliberate waste for purposes of profit is not justified.

(III) Criteria of substitution. In general, the substitution of replacable for irreplacable resources, and plentiful for scarce resources is sound practice, where the former will serve adequately.

(IV) Criteria of harmonious property relation. Pooling of ownership and operation of adjoining natural resources to any extent practicable and with safeguards against predatory monopoly will assure opportunity for effective conservation.

(V) Criteria of overall utilization. Planned utilization of resources should cover all the resources occuring in the region so as to ensure a balanced development. Isolation of individual resources for purposes of exploitation seldom provides the solution to correct use of land.

(VI) Criteria of government action. Governments by their very nature should do certain things for their people which private enterprise cannot or will not do because such services require vast sums of money and are marginal in producing profits. The control and even the operation of many natural resources are activities of this character, and in many situations conservation can be achieved only under public control.

(VII) Criteria of productive powers. The productive powers of natural resources (human resources and capital) are subject to maintenance and increase through positive control and direction, and conservation of resources to serve this end is the exact opposite of a laissez-faire attitude toward them.

(VIII) Criteria of individual responsibility. The freedom of an individual in a democracy must be balanced by a high sense of understanding and assumption of responsibility by every citizen, if (along with other assets) natural resources are to be conserved.

6. In terms of conservation, all natural resources can be classified as either inexhaustible or depletable. Further, the inexhaustible resources are either capable of being misused or else immutable. Depletable resources are divisible into the permanantly-maintainable and the non-maintainable. The maintainable resources are either renewable or non-renewable; and the non-maintable resources are subdivided into reusable and non-reusable. There are thus six distinct classes of resources, and each possesses its own conservation problems. Different methods and measures are required in the conservation and planning proposals for each class.

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Class I. Inexhaustible-Immutable. Supplies for all practical purposes limitless. Such resources (ocean water, solar energy, wind power, etc) present no problem in conservation.

Class II. Inexhaustible-Misuable. Here again the danger of exhaustion is non-existent. The supply is practically limitless, but due to misuse the maximum benefit is often not derived from the resources. Examples are inland waters, water power, area and space, scenery, land relief, etc. A planned use is therefore vital to conserve these.

Class III. Depletable-Maintainable-Renewable. These resources can be maintained permanently at a high level of usefulness, but they can also be depleted at a rapid rate. No matter how far depleted, many of them can be restored. For instance, soil fertility can always be restored by fertilizing and manuring. Restoration of this kind, however, is always slow, painful and costly. The necessity for such measures should be avoided by prompt remedial actions. This calls for what is commonly termed resource planning.

Class IV. Depletable-Maintainable-Nonrenewable. Resources of this kind can also be permanently maintained in productive condition, but they can also be exhausted and ruined for ever. Thus, although soil fertility is readily replacable, when soil is physically destroyed it cannot be replaced. Here again physical resource planning and a strict control of misuse will be helpful.

Class V. Depletable-Nonmaintainable-Reusable. Once extracted for use, the supply of these resources is never renewed. However, the day of exhaustion can be postponed by careful, wasteless and restricted use. Many of the materials in this class can be reclaimed and used over and over again, in some cases prolonging their period of service almost indefinitely. Most metals and some non-metalic minerals belong to this category. Their conservation will involve not only planned use but also an increasing amount of governmental control and supervision.

Class VI. Depletable-Nonmaintainable-Nonreusable. This class of resources should be conserved most carefully. Once used, these materials are never replaced; and there can be no re-use of them. The remedy lies in ensuring a minimum of waste, in substitution wherever feasible and in the extension of the benefits derived from these resources as long as possible. Ultimate exhaustion being a certainty, the most lasting remedy is of course to find a suitable substitute which is inexhaustible (e.g. substitution of atomic power for mineral fuel). In some cases deferred use may be recommended. Strict national control and administration of these resources is imperative.

7. Conservation cannot be achieved piecemeal and isolation of resources for purposes of conservation is undesirable. Conservation and planned utilization should thus cover all resources occuring in the region, and this is especially

essential in a river valley project where a host of natural resources requires careful husbanding. Programmes of water and soil conservation in river valley undertakings normally proceed side by side. Flood control is achieved by the construction of a number of dams which produce equalising basins on the upper reaches of the rivers and their tributaries, and this also provides for irrigation in the dry seasons. Flood control protects both crops and the soil, and the network of canals for irrigation itself helps in agricultural soil conservation.

8. Soil. The sloping ground in most river-basins were once covered with vegetation. Man has ruthlessly destroyed this vegetative protection in his eagerness to extend cultivation. In due course, this has resulted in extensive soil erosion of the sloping land. Soil erosion is generally accompanied by soil wastage and soil exhaustion. A considerable part of river basin areas are thus rendered unfit for agricultural purposes. Measures of soil conservation should be promptly adopted and may include among other measures, plugging of gullies, control of grazing, contour farming, strip cropping, fertility restoration and reforestation. Above all, a proper classification of lands according to their use-capabilities and the adjustement of land utilization to the classification obtained will be most helpful in conserving this very important natural resource.

9. Water. Although over a large area the water resource may appear to be inexhaustible, the local sources of water (e.g. inland water bodies, and ground water) are certainly depletable. Apart from depletion, the problem of water pollution needs attention. A number of tanks (ponds) and stagnant water courses fall into disuse as a result of pollution, and much valuable fishlife is also killed or diseased. The irregular distribution of rainfall over the area quite often makes conservation of water more difficult. The remedial measures which should be taken are: construction of storage reservoirs on rivers and bundhs (dams) across streams to equate flood with drought, proper maintenance of the inland waterbodies to prevent pollution, a well designed system of irrigation channels to prevent wastage of water, a proper drainage system to prevent stagnation of water courses and a proper water use plan in order to resolve conflicting claims on uses of water wherever they arise. It must be appreciated, however, that conservation of water is inextricably tied up with that of soil, forest, wildlife and recreational resources and hence should proceed along with the others.

10. Forest. This important resource can only be maintained with proper conservation practices. But its usefulness is apparently not fully appreciated in many countries. Besides being a source of wood and wood products, a forest also provides grazing ground, watershed protection, protection of soil, wildlife habitat and recreation. The denudation of forest areas is often motivated by the extension of cultivation. The effects of deforestation are the loss in valuable wood products, loss of wildlife and recreational facilities, soil erosion and depletion ot land values. Among urgent conservation measures necessary are protection of forest (from fire, insect pests, plant diseases and overgrazing), select logging, regulation of the lumber industry to prevent over production and over-competition. Afforestation can renew denuded forests.

11. Animal. With the denudation of forests, much of the animal life gets destroyed. Besides serving as food and game for man, animals sometimes act as insect and rodent eaters, protecting vegetation, crops and public health. Other animals are known for useful by-products like fur, horns and tusks. Still others are vital to the ecological balance between the plant and animal world--which in itself has value to humans. Remedies in the essential conservation of wildlife lie in better game regulations, reafforestation, stocking and protecting depleted species, establishing wildlife sanctuaries, introduction of closed seasons in some areas, and protection of the animal's habitat.

12. Recreational Resources. Not much cared for in most countries, such resources have been neglected and defaced along with wildlife and forests. In addition to suggestions regarding water, forests and wildlife, there is a need for organized programmes of landscape beautification and roadside improvement, construction of camping spots, picnic places and public parks.

13. Minerals. Basic to an industrialised nation, minerals are generally limited and exhaustible. Their slow rate of formation in nature indicates that when once used their replacement will be a matter of billions of years, and this makes mineral conservation vital. Minerals are classed as metallics, nonmetallics and fuels. All are depletable and non-maintainable, but while many of the products of metallic minerals are reusable, once the mineral fuels and most of the nonmetallics are used they are permanently lost. Some general conservation practices for all minerals would be to: improve mining operations, reduce waste in mining, substitute more abundant for exhaustible minerals, eliminate competition in mineral industry (state control), introduce planned exploitation of minerals (balancing supply against demand), reduce wastage in product manufacture, use low grade minerals along with high grade ones, stop unregulated export of minerals. With respect of ultimately exhaustible minerals like fuels, extension of the benefits derived from over as long a period as possible and the substitution of these by some inexhaustible materials (substitution by water, solar power and atomic power, for mineral fuel power) should be the two principal aims of conservation and resource planning.

EDITOR'S NOTE. For an earlier elaboration of some of these same points, the reader may wish to refer to Escritt's Regional Planning.

CONSTRUCTION

C.N.T.

Housing and Home Finance Agency, International Housing Agency
REVIEW OF MODULAR MEASURE
Ideas and Methods Exchange, No. 48, March 1958. 7 pages.
721.003 (100)

1. This publication was prepared for the use of the United States Operations Missions as a review of the current status of modular coordination. Our concentration here is on the significance of modular measure and on the international aspects of its application to construction.

Significance of Modular Measure

2. The prevailing methods of design and assembly often are uneconomical due to the frequent lack of relation between dimensions of building materials and the equipment used in building. Because of this, products often must be stocked in a wide range of sizes; which increases costs. In spite of this variety of sizes, cutting and fitting on the job are inevitable. This wastes labor and material, both of which are expensive. On a job, waste has three costs: initial purchase cost for materials, cost of labor in cutting off the waste materials, and cost of disposing of useless waste. The costs involved in designing and detailing buildings which use materials and equipment with unrelated dimensions are higher than if modular sizes were involved. Similarly, the preparation of accurate estimates is more time consuming and more expensive and job-layout is more complex.

3. What the building industry needs is a more thorough application of the well-know principles of mass production. Modular measure, springing from a three-dimensional grid based upon a basic module (4" cube in the United States) makes possible the dimensional coordination of mass produced materials with all of the economies of quick, easy assembly that go with mass production. Under widespread use of modular measure, these economies may be realized because the basic module acts as a guide in determining sizes of related manufactured products. This permits a reduction in inventories and speeds service. The use of the grid simplifies the design of buildings without restricting the designer; it speeds production of working drawings and reduces the chances of expensive errors. Modular design also helps contractors to estimate more quickly and more accurately, simplified field layout, cuts on-site labor and reduces waste of materials.

Development

4. The history of modular measure in the US dates from 1921, when the American engineer Bemis suggested a "cubical modular method," which he later developed around a 4" x 4" x 4" basic module. Under initial stimulus from the Bemis family, the study of modular measure has been sponsored in the United States by groups of architects, engineers, manufacturers, contractors, consumer groups and government agencies. The four major sponsors today are the American Institute of Architects, the Associated General Contractors of America, the National Association of Home Builders and the Producers' council, and the group is called "the Modular Building Standards Association."

Modular Coordination in Europe

5. The European Productivity Agency (EPE) of the Organization for European Economic Cooperation has been conducting important theoretical and practical work on modular coordination. In November 1953 the Productivity and Applied Research Committee called together a group of experts at the suggestion of the United Kingdom. At that meeting it was decided to assemble views and experi-

ences from member countries concerning the theory and practice of modular coordination and to undertake practical work to test the theory. The Secretariat of EPA was assigned the task of carrying on this work. Thirteen countries (Austria. Belgium. Canada, Denmark, France, Germany, Greece, Italy, the Netherlands, Norway, Sweden, the United Kingdom, and the United States) agreed to participate.

6. In the autumn of 1954 responsible organizations in each of the participating countries contracted with EPA to proceed with the work. The British Standards Institution was designated as the technical secretariat to support a working group. Eleven national reports were prepared and the technical secretariat prepared draft reports. The result of the theoretical work was published as "Modular Coordination in Building," Project No. 174, by the EPA in August 1956. This report deals with the theories of modular coordination, the application of theory to the manufacture of building components, and the use of modular components on the building site.

7. At the present time European countries are building structures to test out the practicality of the modular theory. Careful cost records are being kept and every phase is being thoroughly documented. The results will be summarized in a further publication.

8. The United States has maintained an interest in the European studies. The American Institute of Architects and the American Standards Association have been represented in various meetings and consultation. Early in 1957 the Housing and Home Finance Agency, through its International Housing Service, presented to the four sponsors the matter of possible U.S. participation in the European Productivity Agency's Modular Coordination Project. Items discussed included a proposal by EPA that a contract between the American Standards Association (ASA) and EPA be established so that a report could be prepared on one or more buildings in the United States in which the principles of modular measure had been used to the greatest extent practical.

9. The Housing Committee of the Economic Commission for Europe has closely observed for some time the development of the research program in Modular Coordination of EPA. Its interest in this field was stimulated by delegations from the United States who believe, however, that ECE is not the appropriate body to undertake the technological studies in this field. At the present time the Housing Committee is considering when it might best hold a meeting to discuss how governments may encourage the application of modular coordination to their building industries. The implication of such a movement to international trade also is an interest to this body. The United States and its Western friends have believed that the work of EPA at both theoretical and practical levels must be finished and publications released before it is appropriate for ECE to consider promotion of modular coordination among member governments.

American Experience in the Acceptance of Modular Measure

10. To be completely effective, the principles of modular coordination or modular measure must be applied to all segments of the building industry--and ideally this should take place simultaneously. In the United States, the application--despite efforts--has been spotty during the past 18 years. Only few

architectural and engineering designing firms have converted to a modular system but high satisfaction is reported by those who have given the technique a fair trial. Likewise, in the standardization of building materials and components on a modular basis, fewer segments of the building materials industry have converted than have held to the traditional standards and measures.

11. The concrete masonry industry is now almost totally equipped to produce and stock modular units throughout the country. A slightly lower degree of adaption has been evidenced for brick manufacturing, where about 75% of the manufacturers can produce modular sizes. However, in some regions (notably New England the Hudson River basin) manufacturers are not tooled to produce modular bricks, and in other regions such bricks are not stocked but only produced on special order. The reason for low production of modular bricks has been the fact that home builders--who use about 60% of total brick production--have failed to build house to modular dimensions. Structural clay tile, often used in multi-story construction, is available in modular sizes in most parts of the United States. Wood windows are generally modular, and have been since 1947; and so are some metal windows. But doors are often non-modular. There has been some standardization of other materials, such as wallboards and plywood, between-stud insulation batts, and built-in units such as medicine cabinets.

12. Some impetus is being given to the use of modular measure as a result of national legislation requiring some Federal agencies to follow the principles of modular measure in the design and development of drawings for certain types of buildings. The first example of this was military housing, and the practice has now spread to practically all permanent structures under the direct supervision of the Office of the Chief of Engineers, Department of the Army. More recently, under the Housing Act of 1957, a similar practice is required in connection with the design of low rent public housing. The influence of such legislation is expected to be far-reaching.

13. The true significance of modular measure, and its real value, will not be fully understood until the technique has been more widely applied. Progress is slowly being made toward that goal. Problems in dimensioning materials for modular use are being solved dav by dav. Conversion of plants to produce materials in modular sizes is progressing but has been delayed by the fact, among others, that existing serviceable machines and equipment cannot be discarded. Much has been accomplished since the early proposals; and many industries have been, or are being converted to modular materials.

14. Many problems still remain. Building codes must be studied and revised Educational programs must continue to encourage acceptance by the architectural and engineering professions, the building industry, and the producers of building materials. They all must be convinced of the profitableness of a change. In the meantime, all too often the architect does not design for and specify modular materials because many are not yet available. At the same time, materials producers often do not make modular products because architects do not specify them, which prolongs the period of indecision.

A.N.S.

Housing and Home Finance Agency, International Housing Service
QUALITY CONCRETE: MEANING AND TECHNIQUE
Ideas and Methods Exchange No. 49, March 1958, pp. 3-5.
691.32 (100)

1. The article from which this summary is taken is derived from several articles on good practice in the preparation and use of concrete and concrete masonry. It appeared originally in the National Association of Home Builders' Jounral, and was re-worked by the International Housing Service of HHFA at the request of the International Cooperation Administration.

General

2. Concrete is a mixture of cement, water, sand, gravel and sometimes air. When properly mixed, placed and cured, it results in an economical construction material which is strong, durable and water-tight. Some components are chemically active (cement and water) and some are inert (sand, gravel or crushed stone)--the latter being fillers which have little effect on the final quality of the concrete, assuming good materials are used. Cement and water form the chemically active "cement paste," which is very important to the final product since it sets up and hardens to hold together the aggregate particles. The "paste" may comprise from 22% to 34% of the concrete; but the most important ratio is that of water to cement, which largely determines the quality of the "paste." The control of the water-cement ratio is of extreme importance. A common way of expressing this ratio is by stating the number of gallons of water used for each sack of cement. A low water-cement ratio (5 to 6 gallons per sack) produces a strong, high-quality concrete which will be watertight and durable. A high water-cement ratio (8 or 9 gallons per sack) produces weaker concrete, which is apt to leak and may disintegrate badly after a few years service.

Portland cement

3. It is a manufactured hydraulic cement (i.e. a cement which will harden under water and is insoluble in water). It got its name from the quarries on the Isle of Portland, near England, because the inventor, Joseph Aspdin, thought his new product resembled the stone quarried there . It is made by mixing a calcareous material, such as limestone or marl, with calc or shale in proper proportions and then burning this mixture in a rotary kiln at a temperature of 2700°F. This burning produces a clinker which is cooled and then ground into a fine powder, the bulk of which will pass a 200 mesh sieve.

4. Water used for concrete should be clean and free from acids, alkalies, oil or other impurities: generally, water suitable for drinking is also suitable for mixing concrete. Sand and gravel or other aggregate such as crushed stone, slag, cinders or expanded clay, shale or slate are used as an inexpensive filler to increase the volume of the cement-water paste. The particles should be clean, hard, strong and durable, preferably with cubical or rounded pieces. Aggregate should be graded to provide a uniform range of sizes from coarse to fine to insure that the voids between large particles will be filled by smaller particles. Maximum size should be limited to 1/5 the size of the thickness of the wall or slab.

Air Entrained Concrete

5. Air in the form of billions of microscipic bubbles may be added to concrete by using a special type of portland cement which has an air entraining agent interground with it at the mill or by adding an air entraining agent to the other ingredients at the mixer. This entrained or trapped air increases

the durability of concrete and its resistance to weathering in cold areas by serving as relief valves for the expansion of frozen water within the hardened concrete. The tendency for aggregate particles to separate out and for water "bleeding" to occur are also reduced. The use of air entrained concrete is strongly recommended for all exterior concrete walls, slabs, streets, sidewalks or other concrete exposed to the weather.

Mixing.

6. Concrete should be thoroughly mixed until all particles are well coated with the cement paste and the mixture is uniform in appearance and in distribution of the particles. The use of ready-mixed concrete or machine mixing is practically universal today because it does the best job at the least cost. However, small batches may be hand-mixed if care is taken to insure a thorough job. Mixing tools and equipment should be kept clean and in good repair.

Slump.

7. Slump is the term used to describe the consistency or workability of the fresh concrete. Slump is varied by changing the amount of sand and gravel added to the mix for a given water-cement ratio. This means that we can produce a variety of concrete mixtures with slumps ranging all the way from wet to "no-slump" with the same water cement ratio by adding simply more aggregate, and all mixes will have identical properties with respect to strength, durability and watertightness. However, the cost of concrete per cubic yard will vary as the slump and aggregate content varies. Generally speaking, the mixture used should be the stiffest one that can be economically placed. Labor costs for placing should always be balanced against the material cost savings of the stiffer mixes. (Stiff mixes are suitable for pavements, some floors and heavy walls; medium mix is for thinner walls, slabs and beams; wet mix may be used for very thin, heavily reinforced walls). The slump, or workability, of stiff mixes should never be changed by adding more water unless a corresponding additional amount of cement is also added. Adding water alone changes the water-cement ratio which changes all of the properties of the hardened concrete: strength, durability, watertightness.

Handling and Transporting.

8. Concrete must be handled and transported in such a manner that it will not segregate. The less handling the better. Chutes, when used, should be metal or metal lined and built and sloped so that the concrete will travel fast enough to keep the chute clean but not so fast that the particles will separate. A down-pipe or other device should be provided at the end so that the concrete will drop vertically. Smooth and rigid runways should be provided for buggies and wheelbarrows, to prevent excessive jarring and shaking. Wet mixes are much more prone to segregate than stiff mixes and should be handled accordingly.

Curing.

9. Concrete must be moist cured to develop fully all its potential strength, durability and watertightness. Fresh concrete contains more than enough water for curing, but under most job conditions most of this water is lost by absorption and evaporation unless precautions are taken to retain or restore it. Some methods of moist curing are:

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a. Leave forms in place to retain water; continue to wet them down in hot, dry weather to prevent evaporation.

b. Cover slabs, driveways or other flat surfaces with damp burlap, straw, sand or other material and keep it wet.

c. Floor surface with water retained by small earth dams around the perimeter.

d. Spray with a sealing curing compound applied immediately after finishing. Check this to be sure it will not interfere with later installation of floor tile, etc.

Cold Weather

10. Winter should be no deterrent to concrete construction, but the following precautions should be taken:

a. Do not place concrete on frozen ground, as uneven settlement will occur when the ground thaws. Fresh excavations should be covered with straw or other insulating material to prevent freezing until the concrete can be placed.

b. Remove all ice and frost from forms and reinforcing steel.

c. Be certain that the temperature as placed is between 50° and 70° so that the concrete will start to harden. In mild winter weather, when temperatures during the day are around 40° to 45°F, dropping to the mid-thirties at night, this placing temperature can easily be obtained by heating the mixing water used in the concrete. Lower air temperatures may require heating the sand and gravel also. Practically all ready mix concrete suppliers are equipped to furnish heated concrete.

d. Protect the fresh concrete from freezing and maintain suitable temperatures until the concrete has gained ample strength. The amount of protection required will vary with temperature and location of the work. Slabs placed on the ground will require less protection than formed walls or slabs. Since concrete generates heat as it hydrates or hardens the only protection required in mild weather will be covers (tarpaulins, straw or other insulating material) as soon as possible to retain the initial heat plus the heat of hydration. In colder weather it may be necessary to provide supplementary heat by space heaters, salamanders, or other portable heaters. Care should be taken to protect the concrete near the heaters from too much heat and rapid drying. All exposed concrete in the heated enclosure should be kept moist for proper curing.

Accelerators

11. Calcium chloride and certain other proprietary compounds may be used to accelerate the hardening process of concrete and increase its early strength. By accelerating the hardening process, these materials shorten the time interval between placing the concrete and when it begins to generate heat by hydration. Not more than two pounds of calcium chloride per sack of cement should be used, and it is best added in solution as part of the mixing water. Proprietary materials should be used in accordance with the manufacturers' recommendations. Since these materials do accelerate the setting time, a close check should be maintained to permit proper finishing. The addition of two

pounds of calcium chloride per sack of cement will have no corrosive effects on reinforcements, electrical conduits or heating pipes embedded in the concrete if good quality concrete is used. Accelerators are never substitutes for heating materials or subsequent protection of the concrete. Similarly salts, chemicals or other compounds should never be used to lower the freezing point of concrete in cold weather since quantities large enough to be effective would seriously damage the concrete.

Hot Weather

12. Most builders expect cold weather problems with concrete but few are aware that the hot weather also poses some special problems. Among these are strength reduction, cracking of flat surfaces due to rapid drying and difficulty in finishing flat surfaces. Most of these problems can be minimized by the following precautions.

a. Keep placing temperature of concrete between 70° and 90°F. Use cool water for mixing.

b. Sprinkle forms and subgrade just prior to placement. Wetting down surrounding areas will also help cool the surrounding air.

c. Place and finish concrete as rapidly as possible. Progressive placements should always be against a wet edge to prevent cold joints. This may require thinner layers than usual in placing walls.

d. Cover concrete and begin moist curing as soon as possible, and continue water application for at least 24 hours. Alternate wetting and drying should be avoided since it produces pattern checking and cracking. Protecting the concrete from hot, drying winds is also helpful in preventing surface checking and cracking.

Fig. 3(a). A concrete mixture in which there is not enough cement-sand mortar will be difficult to handle.

Fig. 3(b). With correct amount of cement-sand mortar, light troweling will fill all spaces between coarse aggregate particles with mortar.

Fig. 3(c). A concrete mixture in which there is excess sand-cement mortar will be plastic but uneconomical and porous.

GENERAL

D.G.

Oka, Takashi
BULLOCK-GENERATED ELECTRIC POWER FOR VILLAGES IN INDIA
The Christian Science Monitor, Boston, October 18, 1958, Section III, p, 11.
621.311 (540)

1. India, like many underdeveloped countries, has as a chief problem the accomplishment of a technical revolution on a rural as well as an urban basis. This article describes one of the most hopeful developments in such efforts to date in the use of animal power for the generation of electricity.

2. Four-fifths of India's people live in villages, and the major task involved in meeting their needs is making available to them adequate nutrition, water and productive potential. One quarter of the world's cattle live in India; and, to the villager, a team of Brahman bulls is the main source of non-human energy. With such a team the fields are plowed, and with it can be turned the Persian wheel to bring water up from the village well to irrigate sun-baked but potentially fertile land.

3. Leigh Stevens, an American management consultant, toured India with an international study team on small industries in 1953. He was struck by this method used to obtain water: "Could not modern technology be harnessed to improve the efficiency of the Persian wheel and bring more water up within a given period? Could not it be made to transform the uneven lethargic movements of the bullocks into the rapid revolutions needed to generate electricity?"

4. With the assistance of the Ford Foundation and giving generously of his own time and resources, Mr. Stevens called on leading American companies to help him solve these problems. The Texas Gas Transmission Company developed a system of chains and sprockets to convert bullock power, moving draw-bars at less than two revolutions a minute, to 20 and then to 150 revolutions per minute. This is enough to turn a pump capable of lighting 300 gallons of water a minute--which is six times the amount of water the same bullocks, turning a traditional Persian wheel, can lift.

5. Next, the General Electric Company of New York helped Mr. Stevens to design a generator capable of producing power under constant pressure as bullock speed varied. Adding a belt to the system of sprockets and chains evolved for the pump, General Electric's engineers obtained 1,320 revolutions a minute--the average speed of the generator.

6. This bullock-powered generator can be used by day to supply enough power to run a village industry employing 20 to 50 people. This will help to solve India's pressing unemployment problem at its root: the village. At night it can light a village of 150 houses, with one 25-watt tulb in each house and fifteen 100-watt street lamps.

7. It is said that this promises to be the most important technological change in the Indian village since the invention of the Persian wheel itself. The models set up Kranpur (where Prime Minister Nehru attended the opening of such a system to run a woodworking factory in July) were all American-made and were gifts of the companies which developed them. But every component in these models is capable of being produced in India. The technique is still in its experimental stage, but mass-production of the necessary machinery is expected later.

Oka, Takashi. Bullock-generated electric power for villages in India. --2

8. Newspapers from Peking have claimed that technicians have invented a generator powered by donkeys in Inner Mongolia. This has not been verified, however, and there is no information on the generation capacity.

C.M.N.

United Nations, Economic and Social Council
SECOND REGIONAL CARTOGRAPHIC CONFERENCE FOR ASIA AND THE FAR EAST.
20 October to 1 November 1958. E/CONF.25/1, (plus Add.1) E/CONF.25/INF/1, E/CONF.25/L.10 (plus Add. 2), E/CONF.25/L.11, E/CONF.25/L.12, E/CONF.25/L. 13, E/CONF.25/L.19, and United Nations Newsletter Vol. 11/48 p. 14.
(Variously dated between 25 March and 24 October 1958).
526 (100)

1. Although all of the information from this important conference is not yet available, a certain amount is in and seems worth reporting. The conference was convened at Sankei Hall, Tokyo on October 20 in accordance with ECOSOC resolution 600 (XXI), with the Government of Japan acting as host. Dr. Te-Lou Tchang, Chief of the Cartographic Section of the Bureau of Economic Affairs of the United Nations Secretariat was appointed by the Secretary-General to serve as Executive Secretary for the conference.

2. The provisional agenda, prepared by the secretariat on the basis of replies from governments, included the following general topics:

a. Establishment of a regional inter-governmental cartographic commission or organization for Asia and the Far East;

b. Geodesy:

1- Establishment of long standard baselines for calibrating geodimeters and other radio-electric and electro-magnetic devices, as well as for assuring the accuracy of networks (Japan).

2- International connexion of geodetic co-ordinates (Japan)

3- Maintenance of national standards magetometers and their comparison (Japan).

4- Observation of national gravimetric nets and their international connexion (Japan).

5- Extension of gravimetrical observation in neighbouring seas, for utilization of the Stokes Formula (Spain)

6- Recommendation for an increase in high seas soundings in those neighbouring seas for which they are deficient or non-existing (Spain).

7- Classification and standards of accuracy of geodetic control surveys (United States)

8- New methods and techniques in geodetic surveying, including gravimetry and geomagnetism (United States)

9- Adjustment of trilateration networks by means of analogue computers (Netherlands)

c. Aerial Photography:

1- Status of aerial photography programmes (United States)

2- Economic evaluation of aerial photographs in conjunction with topographic geological and geophysical measurements from the air (Fed. Republic of Germany)

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d. Topographical mapping:

1- Application of photogrammetric method in map-making (Netherlands)

a. Simplification of cadastral survey by use of air photographs

b. Productivity of third-order photogrammetric instrument for compilation of geographical maps.

c. Importance of auxiliary instruments in photogrammetry.

d. Consequences of the application of electronics to photogrammetric production of maps.

e. Adjustment of aerial triangulation according to the method of least squares by means of analogue computers.

f. Automation in photogrammetry and its impact on map production (Fed. Republic of Germany)

2- Cooperation in mapping boundary areas (Netherlands)

3- Cartographic problems related to the use of air photographs for the study of the earth's crust for economic and social planning (Netherlands)

4- Air survey combined with electronic control methods (Shoran, Radar and Decca) for the purpose of small-scale topographical maps, at 1:200,000 and 1:500,000 (Columbia).

5- Standards with respect to scales, formats, contents and accuracy for topographical maps (United States)

6- Recent developments in photogrammetric plotting instruments (United States).

7- Questions relating to the establishment of a 'cadastre' (Fed. Republic of Germany).

e. Tropical maps: International cooperation in the preparation and publication of tropical maps (Japan).

f. International Map of the World on the Millionth Scale (IMW)

1- Promotion of the publication of the International Map of the World (Japan)

2- Report on progress made with respect to Economic and Social Council resolution concerning amendments to existing IMW specifications, keeping in mind the need for maintaining both the ICAO World Aeronautical Chart Series and the IMW Series (United States)

3- International standardization of sheet lines and projections for the land and air series of 1:1 millionth scale (United Kingdom)

4- International standardization of names, spelling and transliteration (United Kingdom)

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g. Aeronautical charts (United States)

1- Requirements for aeronautical charts and aeronautical information publications.

2- Recent developments in technical equipment used for aeronautical charts

i. Hydrography:

1- Reports by governments on present status of their hydrographic work (Japan).

2- Hydrographic charting for navigation safety (Japan)

3- Special charts for the exploitation of sea resources, including fisheries charts, bottom topographical charts, sediment charts, submarine reological charts, charts showing technical constructions under the sea (Japan)

4- Discussion of technical resolutions adopted by the VIIth International Hydrographic Conference (United States).

j. Report on progress made in drafting the general framework of a programme looking toward uniformity in the writing of geographic names (Paragraph 4a of resolution 600 (XXI) adopted by the Economic and Social Council on 2 May 1956) (United States)

3. Information received so far includes two technical commentaries on aerial photography (c. 2-) by Dr. K. Volger and "Geographic Evaluation of Aerial Photographs Topographic Evaluation of Aerial Photographs" by Dr. E. Meynen. There is also a rather interesting discussion of the Economic Land Use Map of Sweden.

Standardization and Uniformity of Geographical Names

4. The most interesting developments so far reported from the conference are those dealing with the problems of geographical names. (Item f 4- and j above). Dr. Meredith F. Burrill, Executive Secretary of the US Board on Geographic Names, has outlined the difficulties in obtaining agreement on spelling of names and has suggested that the following alphabets be used for international conferences. Roman, Cyrillia, Greek, Hebrew, Amharic, Arabic, Indic, Tibetan, Burmese, Siamese (Thai), plus the writing systems of Chinese, Japanese and Korean.

5. The position of the Government of Iran is that the United Nations should work toward a uniform basic alphabet, including all the essential sounds but kept as simple as possible. One step in this direction is the Razmara system for transliteration of Iranian to Roman (French and English sounds), used in the Iranian Geographical Dictionary and felt to be simpler than similar schemes.

6. The British position was that the most satisfactory basis for standardization of names is the written form rather than the sound of the name or its meaning, and that the Roman alphabet, supplemented by diacritical marks as

UN. Economic and Social Council. Second regional cartographic conference for Asia and the Far East. --4

necessary, would provide the most effective means of standardizing the writing of such names. A great deal of attention has been given this problem in Great Britain since 1836, and a system of spelling foreign geographical names was developed for 52 countries after 1920. Editions of the alphabets involved have been revised and re-issued as late as 1951, and a new "Principles of Geographical Nomenclature" (or "P.C.G.C. Principles") was published in 1954.

PRONUNCIATION KEY

used in the Iranian Geographical Dictionary

Signs	Iranian Equivalents	French Pronunciation	English Pronunciation
a	اَ	*i*mprimer	*a*nswer
e	اِ	mod*è*l	ann*e*x
o	اُ	*O*range	*O*rder
ow	کشش صدای ضمه مانند (دوک)	—	l*ow*
â	آ	*A*ge	h*a*rd
i	ای	t*i*r	*i*ll
u	او	*O*uvrage	p*u*t
b	ب	*B*ord	*B*ad
p	پ	*P*orte	*P*ark
t	ت - ط	*T*able	*T*able
s	ث - س - ص	*S*ang	*S*ong
j	ج	*dj*	*j*apan
ç	چ	*tch*	*Ch*ange
h	ح - ه	*H*auteur	*H*orn
x	خ	*kh*	*kh*
d	د	*D*rapeau	*D*ash
z	ذ - ز - ض - ظ	*Z*inc	*Z*one
r	ر	*T*endre	*T*ail
ž	ژ	*J*ardin	—
c	ش	*Ch*apeau	*Sh*oe
'	ع و همزه ساکن	—	—
q	غ - ق	*gh*	*gh*
f	ف	*F*roid	*F*ar
k	ک	*K*ilometre	*K*ind
g	گ	*G*roupe	*G*uess
l	ل	*L*ambert	*L*ondon
m	م	*M*onde	*M*ad
n	ن	*N*oire	*N*oise
v	و	*V*oix	*V*alue
y	ی	*Y*acht	*Y*ear

UN. Economic and Social Council. Second regional cartographic conference for Asia and the Far East. E/CONF.25/L.11. 3 September 1958.

Instructions for spelling in the conventional alphabet

1. Standard native pronunciation is to be taken as the basis for spelling.
2. Each sound is to be represented by its closest corresponding symbol, and a symbol may be doubled only to indicate a clear repetition of the same sound.
3. If their representation be indispensable, a vowel-symbol may be marked with:
   (a) an acute accent (´) for stress (Kórinthos - Greece)
   (b) a macron (¯) for length (Tōkyō - Japan)
   (c) a tilde (˜) for nasalization (Eggã - Nigeria, unofficial).
4. Retroflex, emphatic, implosive or ejective consonants may be indicated by dots beneath the symbols representing them.
5. Palatalization of consonants as in Russian may be indicated by an apostrophe (') after the symbol affected.
6. If it be imperative to distinguish between sh and zh (the symbols given above) and aspirated s and z respectively, the alternative symbols š and ž may be used for the former pair. Similarly, c and ch could stand for the unaspirated "ch" sounds respectively.
7. In the narrow rendering of names in, and their close transliteration into, the conventional alphabet, recommended for textual documents and particularly for gazetters, the diacritical marks listed in 3, 4, 5 and 6 above, should be used. From the broad rendering in, and broad transliteration into the conventional alphabet, appropriate to maps and charts, these marks may be omitted. This instruction applies only to the conventional alphabet and has no bearing whatever on No. 5 of the Principles of Nomenclature.

Alphabetical order

The full conventional alphabet consists of the following thirty-seven symbols:

a, b, ch or c, d, dh, e, f, g, gh, h, i, j, k, kh, l, m, n, ñ or ny, ng, o, ö, p, q, r, sh, or š, t, th, u, ü, v, w, x, y, z, zh, or ž (')

but names written in it should be filed or arranged in common English alphabetical order disregarding (').

UN. Economic and Social Council. Second regional cartographic conference for Asia and the Far East. E/CONF.25/L.11. 3 September 1958

CONVENTIONAL ALPHABET

Symbol	Range of sound represented
	Vowels
a	a in father; all the sounds represented by a in the French words patte, pas, page, pâle; o in English son or u in cut; also a shade of the unstressed neutral vowel (see under ö below).
e	The first part of the diphthong in day, e in French thé; ai in fair, è in French père; e in bet; a shade of the unstressed neutral vowel (see under ö below).
i	ee in fee, i in French si; i in Italian via; i in sit.
o	ou in bought, aw in law, o in not; eau in French beau, o in rotund.
ö	ö in German schön, eu in French peu; eu in French peur, oe in French oeuf; ea in earth (the last is the stressed neutral vowel in English). The unstressed neutral vowel (the sound of a in marine, e in often, u in difficult) is better represented, according to its nearest approximation, by a or e.
u	oo in boot; oo in foot or u in put (but not in but).
ü	ü in German über, u in French lune.
y	the cavernous vowel, unknown in standard English, represented by ы in Russian and by ı in Turkish. Note that y is also used for a consonant-symbol (see below).
	Diphthongs
	Diphthongs may be represented by combinations of the vowel-symbols given above.
	Consonants
b	English b, any other sound recognized as a kind of b by English ears, as b in Spanish saber.
ch or c* (=tsh)	ch in church. c is established with this value in parts of Africa.
d	any sound recognized as a kind of d.
dh	the soft sound of English th in this, they, etc.
f	any kind of f.
g	g in got or gift.
gh	the soft guttural sound represented by غ (ghain) in Arabic, which resembles that of Parisian r.
h	(i) the aspiration of vowels (the sounds preceding the vowels in her hat).

* See Instruction 6

APPENDIX

EXAMPLES OF CURRENT WORK BY DOXIADIS ASSOCIATES

THE FUTURE OF KIRKUK

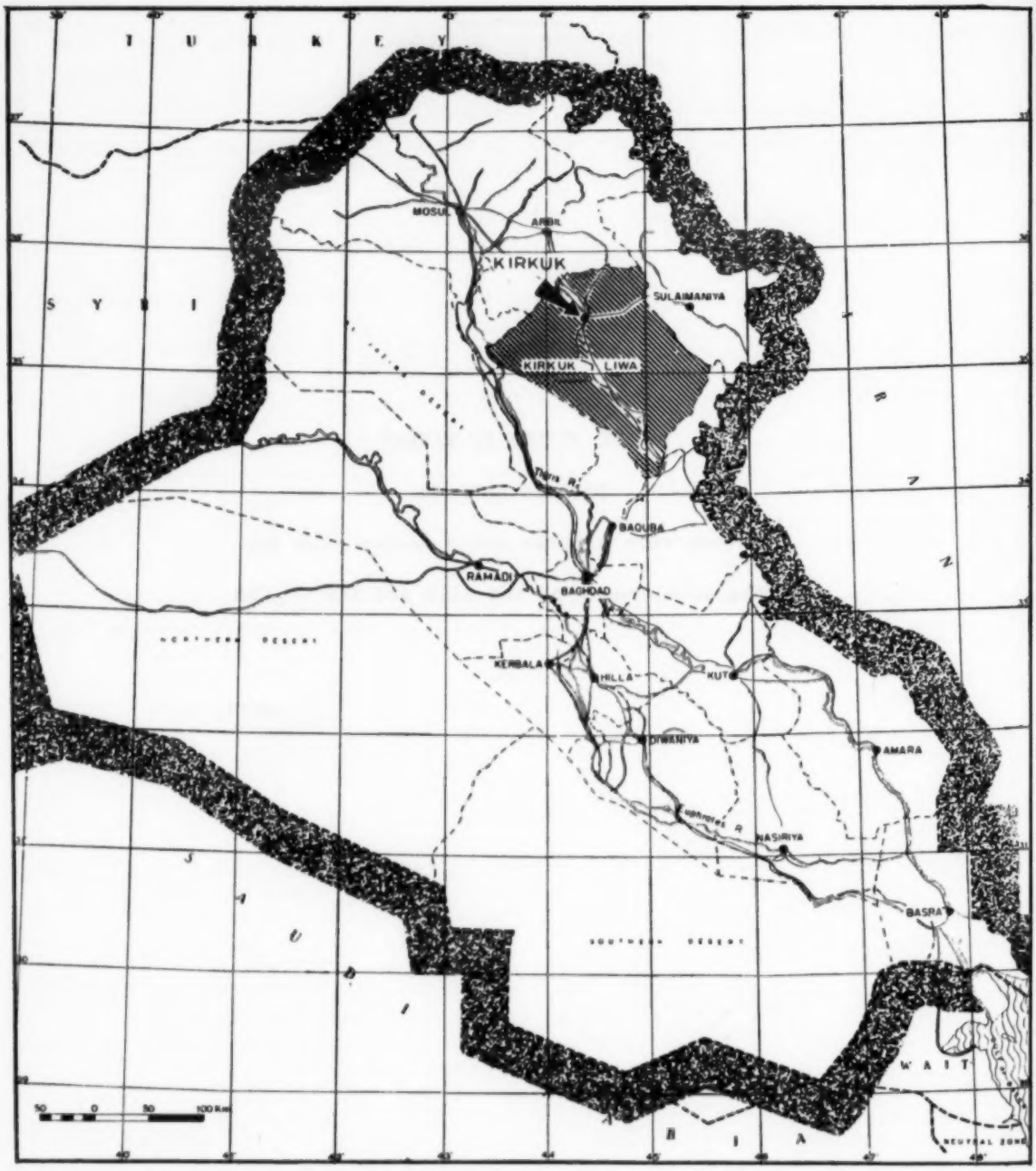
Project QGHP 66

A long term program and a master plan for

the development of the city and its region

Summary of the preliminary Report (Document DOX-QA 76, 9-9-58) issued to initiate discussions for the future of Kirkuk with the Government of the Republic of Iraq Development Board and Ministry of Development - Technical Section 5.

LOCATION OF KIRKUK IN THE COUNTRY



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The future of Kirkuk, Iraq, 1958.
711.433

Introduction

1. The Development Board of Iraq decided in March, 1957, that Master Plans should be prepared for those towns for which large scale housing schemes had been programmed. Kirkuk is among these towns.

2. The following is a digest of the preliminary report on a long term Program and Master Plan introducing the major problems of the city of Kirkuk together with suggested policies and programs to be adopted for its development. The preparation of an interim report containing detailed programs and plans is already in progress and will be submitted to the Development Board. The general principles outlined in this preliminary report have been considered and approved.

3. Kirkuk has grown rapidly during recent years as a result of the development of the adjacent oil field and oil refinery. It is now a city of 120,000 people and lies 235 km north of Baghdad on the Khasah Chai, a tributary of the River Tigris, and at a junction of three main roads. It is the capital of the liwa which has the same name and which has a population of approximately 390,000.

4. Kirkuk is situated on both sides of the Khasah Chai in an area sloping from north-east to south-west. At the north-east end of the town the ground is characteristically undulating. At the east side of the Khasah Chai there is a high rock plateau, called at Qala, 383 m. above sea level, where the town was first developed.

5. Like most of the towns of Northern Iraq, Kirkuk has a very hot, dry summer and a cold humid winter. The prevailing winds are from the north-east and north.

6. The history of Kirkuk begun many centuries ago. The Assyrian King Sardana seems to have been the founder of the town. From that time there have been many rulers and many changes until the time that Iraq became independent.

THE PROBLEMS

Problems relating to the economy of Kirkuk

a. Industrial

7. One of the most important oil deposits of the world has been tapped below the top surface layers of Kirkuk and its environs. This fact accounts for the town's great importance to the economic development of the whole country.

8. In addition to the extraction and refining of oil at the I.P.C. refinery, 7 kms north west of the city, the Kirkuk region yields natural gas and a power station has already been constructed at Dibis, about 40 km to the north west. There is little doubt that this area will see considerable industrial development.

9. A further potential source of natural wealth is the extraction of sulphur from the soil and a new Sulphur Recovery Plant is to be constructed within the next few years inbetween Kirkuk and Dibis.

10. These developments could be expected to exercise a powerful influence drawing the extension of Kirkuk in a north-westerly direction. This is at present held in check by army installations and industrial reservations.

KIRKUK TOWN AND ITS SURROUNDING REGION

The future of Kirkuk, Iraq, 1958. --2

11. Other industries in the neighbourhood of Kirkuk include some production of gypsum and manufacture of bricks.

12. Within Kirkuk itself there is very little industry, but such as it is, it is scattered throughout the city and, in the absence of any control its development could easily became a major problem.

b. Commercial

13. Kirkuk has a larger number of commercial establishments in relation to its population than most other capitals of liwas. All together in 1957 they numbered almost 600 and employed almost 2,000 persons: this represented about 23 establishments per 1,000 of the population.

14. The commercial center of Kirkuk, originally situated in the area of the suks, within the original core of the city, has now extended to the West bank of the river, where the erection of new buildings has been carried but without any farseeing overall program.

15. The original idea of the narrow shopping street or the closed suks is unfortunately losing supporters among he shop-owners. Indeed shops are spread all along the main highways creating a most undesirable situation from the points of view of traffic, car parking and shopping facilities. This situation is likely to become aggravated as the new industrial wealth of Kirkuk liwa increases the size and importance of its capital city.

Problems of Kirkuk's communication system:

a. Road

16. Kirkuk is a key point of communications in North Iraq and particularly in the movement to and from Sulaimaniya. Four major highways connect the town with Baghdad, Dibis, Arbil and Sulaimaniya. Work on the realignment of the last is well under way.

17. The fast growth of the town in the last few years created the need for the opening of new and the widening of existing roads, as well as for the control of the haphazard sprawl of the town. A town plan was drawn up in 1952 and is at present the official plan of the town. Although new roads are wide enough, traffic creates congestion in the area near the two bridges. Streets in the old quarters are of no fixed width and unpaved.

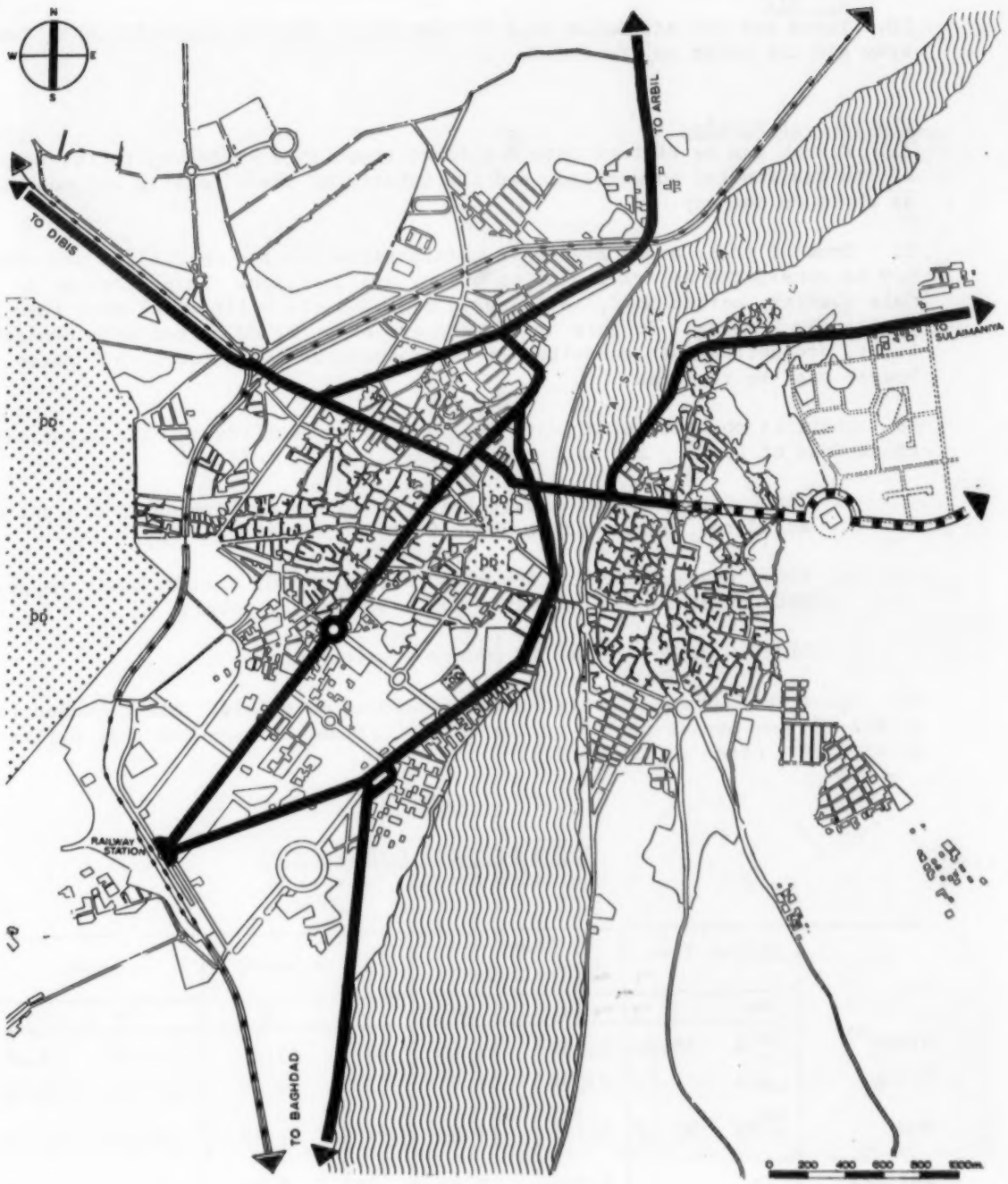
18. The internal main road network presents many problems, in particular in the area adjacent to the two bridges. Paving and drainage of most of the streets, widening of main roads and opening of new arterial roads are needed. Improvement of the approaches to the town and to its central area are also necessary.

b. Rail

19. Kirkuk lies on the railway route Baghdad-Arbil. There is also a line from Kirkuk to the I.P.C. installations. The railway station and its facilities are not sufficient to cope with the volume of traffic at its peak. Both the station and the rail lines interfere with the proper expansion of the town.

NEW STREETS AS PROVIDED BY THE TOWN PLAN OF 1952

EXISTING MAIN ROADS



c. Air

20. There are two airfields West of the town. One of them belongs to the army and the other to the I.P.C.

Problems of Housing

21. Kirkuk can be divided into distinctive sections according to the types of its residential communities and the density of their housing accomodation, as shown on the map.

22. Some of these areas have most unfavourable housing conditions and they may be considered as areas needing urgent amelioration. In particular Al Qala quarter, market No.1, is the area most densely built, with more than 60 houses per hectare. In this area there are about 1,500 houses most densely built, presenting most unhealthy living conditions. Eventually all these houses must be replaced.

23. There is no statistical data available regarding the age and structure conditions of houses, but they may be classified as follows:

a. Contemporary houses structurally sound and conforming to present-day standards, estimated at about 20% of the total.

b. Older houses which, while structurally sound, are not built to up-to-date requirements estimated about 30% of the total.

c. Old houses not suited to modern requirements.

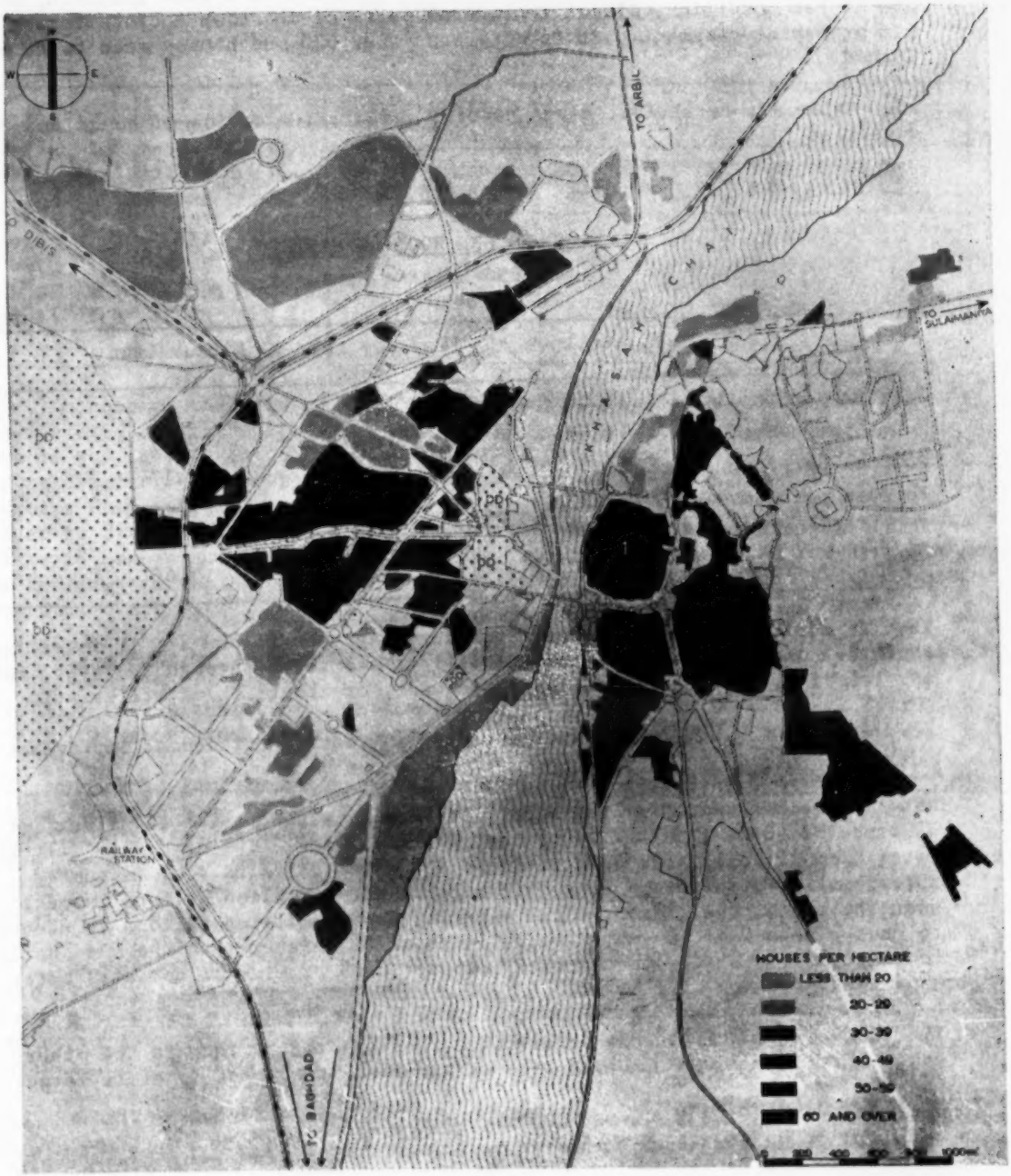
24. Stone and mud are the predominant building materials. Stone houses cover 48.86% and mud houses 33.60% of the total. It may be expected that bricks will be used more often in the future.

TABLE I

TYPES OF HOUSE CONSTRUCTION
(1956 Housing Census)

	Kirkuk Town		Liwa Capitals Total		Kirkuk Liwa		Iraq	
	No	%	No	%	No	%	No	%
Stone	5510	48.86	23359	11.15	6160	12.74	46127	6.27
Brick	885	7.85	81380	40.93	1055	2.18	111871	15.22
Mud	3790	33.60	46191	23.23	39456	81.57	304296	41.39
Sarifas	-	-	37056	18.64	119	0.25	194629	26.48
Other	1093	9.69	10814	5.45	1579	3.26	78237	10.64
Total	11278	100.00	198800	100.00	48369	100.00	735160	100.00

NUMBER OF HOUSES PER HECTARE



The future of Kirkuk, Iraq, 1958. --4

Whilst many of the 3.790 houses built with mud are of a good standard, numbers are in bad condition, placed in central parts of the town andinterfering with its proper development. It is estimated that 600 mud houses need to be replaced.

25. Table II herebelow, gives several comparative ratios of house and room densities.

TABLE II

HOUSE AND ROOM DENSITIES

(1956 Housing Census)

	Kirkuk town	Liwa capital average	Kirkuk Liwa	Iraq
Persons per family	5.54	6.02	5.36	5.65
Rooms per house	2.92	2.67	2.77	2.20
Persons per room	2.73	2.69	2.17	2.74
Persons per house	7.98	7.18	6.02	6.03
Families per house	1.44	1.19	1.12	1.07
Rooms per family	2.03	2.24	2.46	2.06

26. In addition to the figures given in paragraphs 23 and 24, it is estimated there are another 600 substandard dwellings scattered through the town, making a total of 2,700 houses needing replacement, or about 25% of all existing units.

27. A further 2,800 houses are estimated to require structural improvements.

Problems of Public Health

28. The main source of water supply in Kirkuk is the Lesser Zab river, at a distance of 40 km from the town, near Dibis village. The naturally-filtered water from 11 wells is stored in tanks and after chlorination, is pumped through a 26" pipe to two tanks, (2 million and 1 million gallons respectively) near the town. The present total capacity of 8.2 million gallons is adequate to meet a demand of 68 gphy* which is about 60% higher than the mean daily consumption per head. Consequently, there is no problem of domestic water supply at present.

29. Sanitary installations in Kirkuk houses are better than in the other towns of the country. However, the margin for improvement is still large.

*gallons per head.

The future of Kirkuk, Iraq, 1958. --5

TABLE III

HOUSE SANITARY CONDITIONS
(1956 Housing Census)

	Kirkuk town		Liwa capitals average		Kirkuk Liwa		I r a q	
	No. of houses	% to total	No. of houses	% to total	No. of houses	% to total	No. of houses	% to total
Houses with a bath	4877	43.24	57098	28.72	5875	12.15	75252	10.24
Houses with a toilet	11098	98.40	152613	76.76	14599	30.18	264748	36.01

30. In general there is no sewerage system in Kirkuk town. There are only a few covered sewers, which carry the sewage by gravitation to an outlet in the bed of the river. In other cases there are open drains in the streets cleaned by rain-water. The sewage accumulates at a point of the river bed in the old garbage disposal area. There is no sewage treatment plant. As stated, the river is dry for more than six months of the year and in the disposal area the waste is washed away only when the river is flowing. One of the major problems of the town is the complete lack of any type of sewerage, either sanitary or for storm water.

31. The situation is somewhat better in respect of newly-built private houses in which cesspools are provided. These casspools are emptied on request by the Municipal Authorities. In the housing scheme of the Development Board (QSPA 10), provision has been made for a treatment plant.

32. A thermic Power Station, owned by the I.P.C. and located at a distance of 16 km from the town in the New Baba locality, supplies the town with electricity. The Station's power is 45,000 KW. At the present, the average power that the town receives from the Power Station is about 1000 - 1400 KW. The connection with the electricity supply network of about 40% of the existing houses is needed.

33. The Municipality provides a most primitive garbage disposal service. The garbage is collected from private houses by donkeys and is carried to garbage dump, a 4-walled enclosure with a 2 m. opening on one side, almost in the center of the town. The garbage is removed by lorries to the dry river bed in a location 2 km away from the town off the Baghdad road.

34. In Kirkuk there is only one General Hospital for public use. The number of 192 beds and the facilities provided in this hospital are quite insufficient. There is also a General Hospital with 125 beds in the I.P.C. area for the use of its employees only, a military hospital with 150 beds and 14 dispensaries.

TABLE IV

HOSPITALS IN KIRKUK LIWA AND TOWN

(Ministry of Health - 1957)

	No. of Beds		Population served		No. of beds per 1000 people	
	Town	Liwa	Town	Liwa	Town	Liwa
General hospital	192	256				
Prison hospital	12	12				
Isolation hospital	23	23				
Total	227	291	90593	358912	2.5	0.8
I.P.C. hospital	125		30000* approx.		4.17	
Army hospital	150					
Iraq, total		8881		6495645**		1.37

The existing hospitals and dispensaries are quite insufficient for the needs of the town and, furthermore, for the needs of the whole liwa, which is served by them.

Problems of Community Equipment

a. Administration

35. The administration services of the town are accommodated in a very old building. No new administrative buildings worth mentioning exist. The need for a new civic center where all Government and Local Authority Services will be properly accommodated in connection with cultural and social activity buildings is urgent.

b. Education

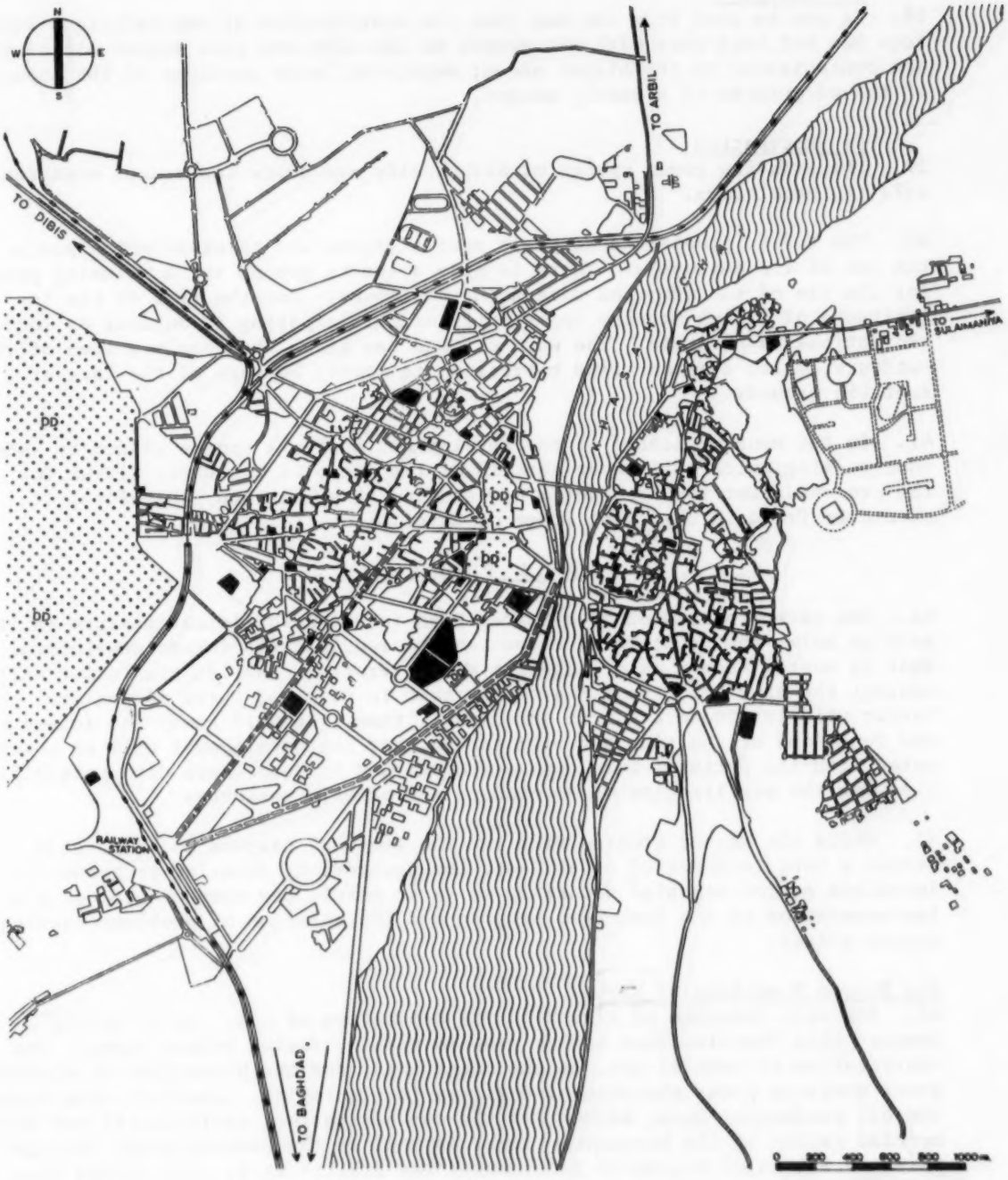
36. The schools are housed in most unsuitable old buildings. Only 16, of a total of 54 primary schools, are new buildings, the others being housed in rented buildings. As shown on the map almost all the schools are built in or around the old quarters of the town. This is a handicap for the inhabitants of the new suburbs.

37. The existing ratio of 231.7 pupils per elementary school is quite acceptable, but new schools are needed, not only to replace those now operating in unsuitable rented buildings, but also to cover the needs of the expanding population and of those children who are not attending school now but eventually will do so.

* Employees of the I.P.C. in Kirkuk and members of their families

** Preliminary results of census 1957 - not including Iraqi nationals abroad.

EXISTING SCHOOLS IN KIRKUK



The future of Kirkuk, Iraq, 1958 --7

c. Religion

38. It can be seen from the map that the construction of new religious buildings has not kept pace with the growth of the city and that almost all of them are concentrated in the oldest areas; depriving large sections of the population of the advantages of a nearly mosque.

d. Recreation

39. The existing green spaces of Kirkuk city are quite inadequate even for its existing population.

40. The I.P.C. provides a complete sports ground and three swimming pools for the use of its employees. There is also a sports ground and a swimming pool for the use of the army and Government employees. But the rest of the inhabitants of Kirkuk have no opportunity of participating in outdoor or indoor recreational activities. The warm climate has given the people a love of the outdoors, which does not find expression in sport, because of the lack of suitable grounds.

41. In the Housing Scheme of the Development Board, a sports ground is under construction which will cover certain of the needs of the whole Kirkuk for the present. But the need for a new stadium is urgent and, therefore, it should be faced in the first stage of development.

THE POLICIES

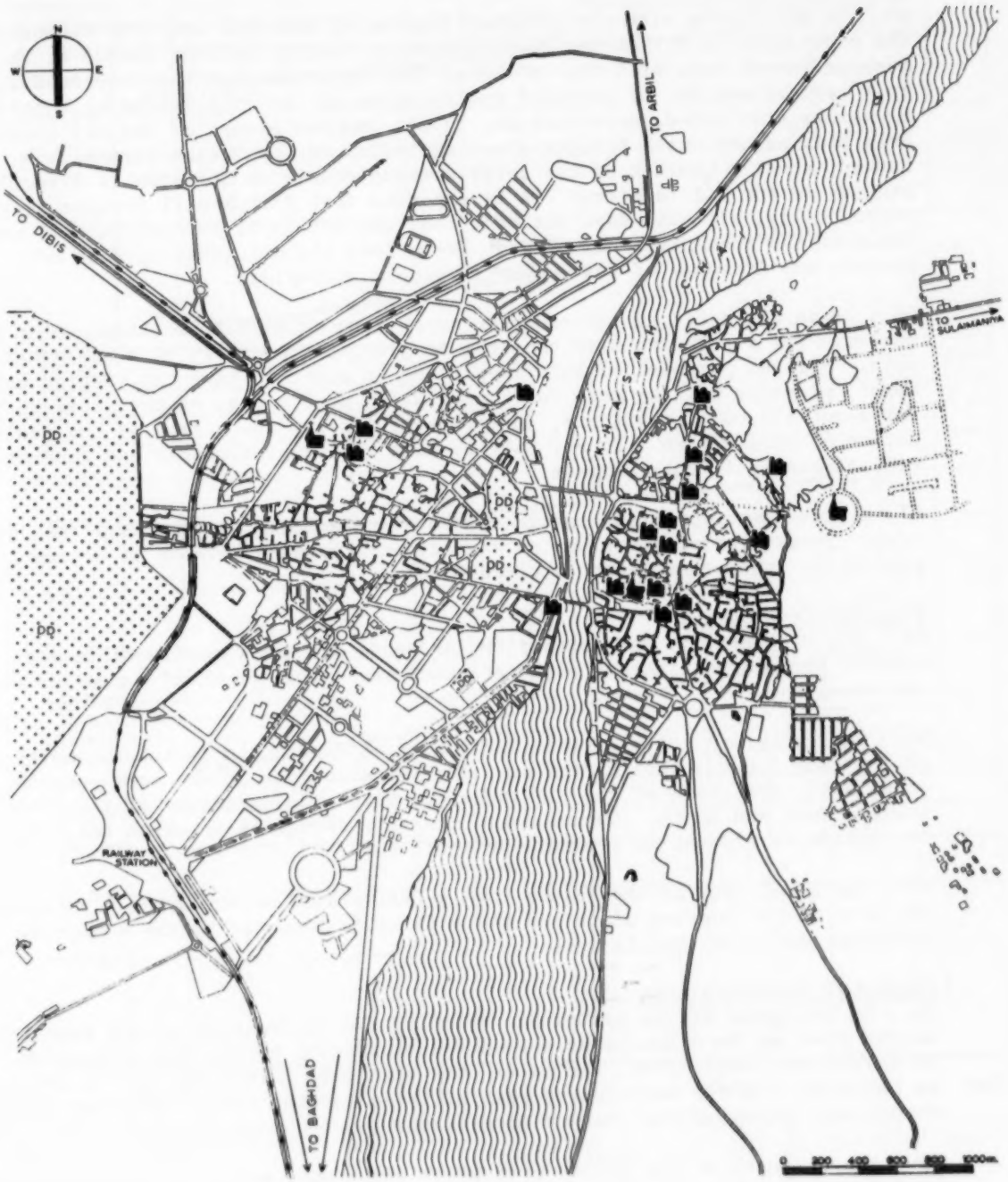
42. The mere preparation of a Master Plan is not a sufficient measure in itself to solve the problems of a town and to regulate its future development. What is mostly needed is a long-term Master Program. Whilst the former will control the physical expansions of the town in terms of three dimensions, the latter will introduce a fourth dimension: time. It will study the future size and functions of the town and will ensure that its development will be coordinated with the National Development Program and in accordance with possibilities for the mobilization of Government and private resources.

43. While the Master Program will set the eventual targets to be reached within a long-term period of at least one generation, detailed programs for immediate action are also necessary so as to permit the commencement of the implementation of the long-term program and the solution of problems needing urgent action.

The Future Functions of Kirkuk

44. The main function of Kirkuk is the production of oil. It is mainly through this function that Kirkuk grew so rapidly during recent years. The exploitation of natural gas, on the other hand, for the production of electric power attracts power absorbing industries in its region. However, even before the oil production boom, Kirkuk was the administrative, agricultural and commercial center of the homogenous liwa, as well as the communication throughpoint of all major routes to Sulaimaniya and Arbil. It is anticipated that Kirkuk will continue to serve these functions.

DISTRIBUTION OF RELIGIOUS BUILDINGS AND MONUMENTS



The future of Kirkuk, Iraq, 1958. --8

The Future Growth of Kirkuk

45. In accordance with the official figures of the 1947 and 1957 censuses the population of Kirkuk has been increasing during the last decade at an average annual rate of 5.9%. Although this apparent high rate may be due, to a certain extent, to probable inaccuracies of the 1947 census it should be mainly attributed, nevertheless, to the immense growth of the oil industry over this period which brought about an influx of population into Kirkuk. Indeed, about a quarter of the total working people in the town is directly engaged in the oil industry. It is expected that Kirkuk will further progress economically, but this does not mean that the influx of population will continue at the same rate. It already seems that the oil industry does not foresee any increase of the number of people it employs.

46. It is difficult to foresee the exact rate of population increase in the future. The population will continue to grow, but probably at a diminishing rate. For the purposes of this report and in order to have the program safely based, planning will be done for a population double that of the present, i.e., for about 250,000 inhabitants, independently of the exact time of the realization of this figure. It may only be said that approximately one generation will elapse until this happens.

47. Kirkuk liwa population has increased at more or less the same rate as Iraq. Consequently, there was no significant increase because of movement of population from other liwas to Kirkuk liwa.

Physical Development

48. The availability and suitability of lands and the centrifugal forces applied by external factors will influence the future physical expansion of the town.

49. The topography of the lands lying East of Kirkuk limits the expansion of the town towards that direction. The installations of the army, on the other hand, and those of the oil industry, block the expansion of the town towards West and North. Consequently the only direction in which the city can expand at present is towards the South West.

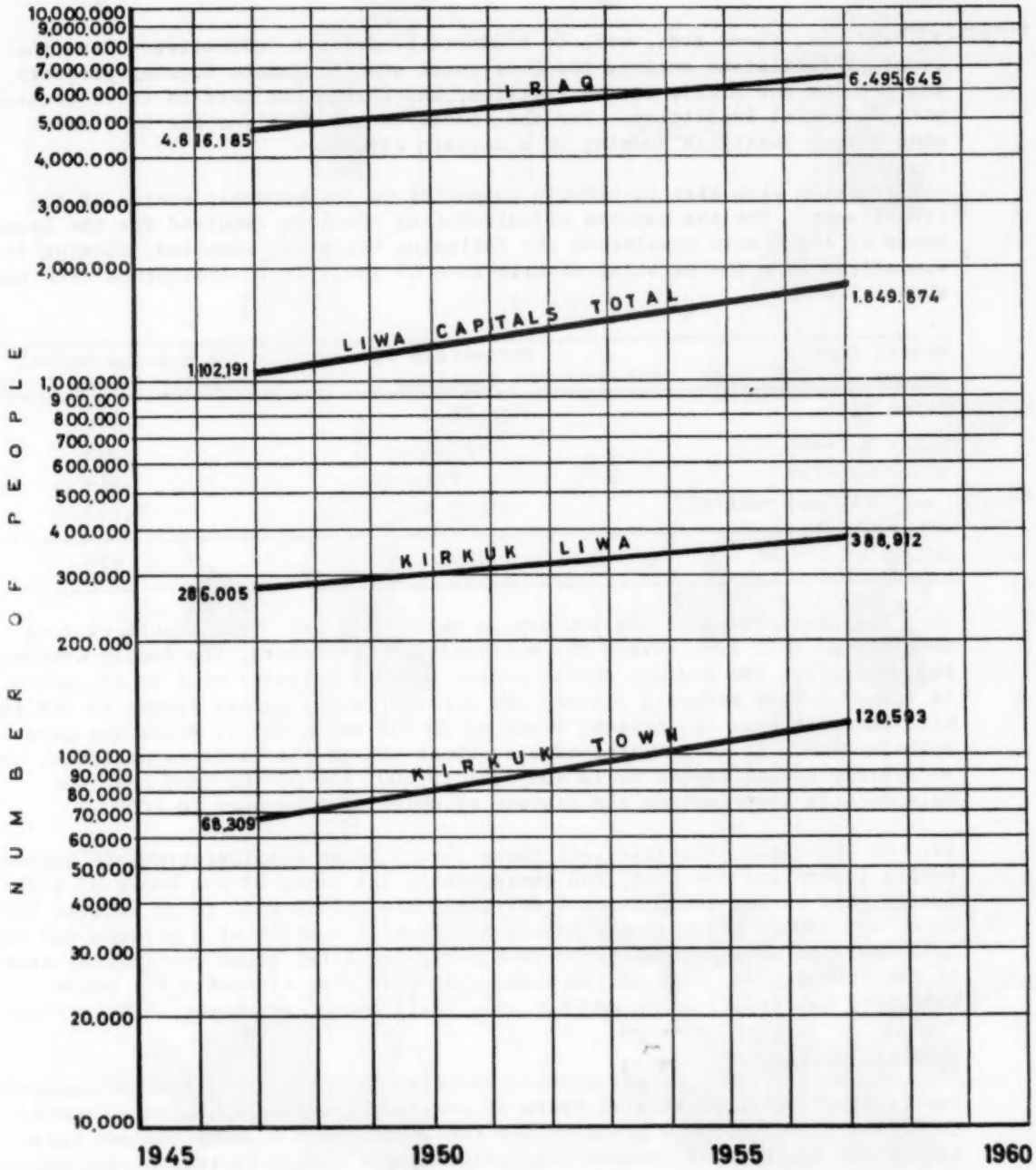
50. The total area of the future town is calculated on the assumed population, the size of the housing plots and the area to be accupied by the community buildings and other public uses.

Financial Considerations

51. On the basis of the estimates regarding the future size of the town, its Master Plan may be drawn up as a physical expression of the Master Program. To ensure its realization, its total cost should be calculated and it should be compared with the anticipated possibilities for the mobilization of public or private resources and checked accordingly.

52. The estimate of the public or private resources, which may become available, is of utmost importance, as the total investment needed for the realization of the plan will be financed by all parties concerned. Thus, projects of national importance will be financed by the Government while projects of local importance will be taken care of by local administration, with or without Government subsidies.

INCREASE OF POPULATION



ANNUAL RATES OF INCREASE

IRAQ	3.0 %
LIWA CAPITALS	5.3 %
KIRKUK LIWA	3.1 %
KIRKUK TOWN	5.8 %

The future of Kirkuk, Iraq, 1958. --9

53. Houses, shops etc., will be financed by private initiative. Nevertheless, to facilitate action, the Government should finance housing projects for the low and middle income families, and charge the cost to those concerned with financial facilities. For the lowest-income families the Government should also subsidize housing to a certain extent.

54. Housing plot size is closely connected to the economic status of the inhabitants. For the purpose of calculating the area required for the housing needs of the future population the following table was compiled, showing in a summarized form the existing distribution of families in accordance with their annual income.

Annual Family income in ID*	Percentage of Families	Average annual family income in ID
Below 250	40.0	150
251-450	41.8	335
451-750	9.9	614
751 and over	8.3	2,133
Total	100%	438

55. The development of the country is well under way. The results of this development will soon affect the national and, therefore, the family economy. Presuming that the average annual income rate of increase will be 4%, which is indeed a very moderate figure, the average family annual income in the town will increase from its present level of ID 438 to ID 960 in about one generation's time. It is anticipated that about 10% of the families will then have an average annual income of ID 400, 25% ID 500, 25% ID 700, and that the balance will earn incomes the average of which will be over ID 1000.

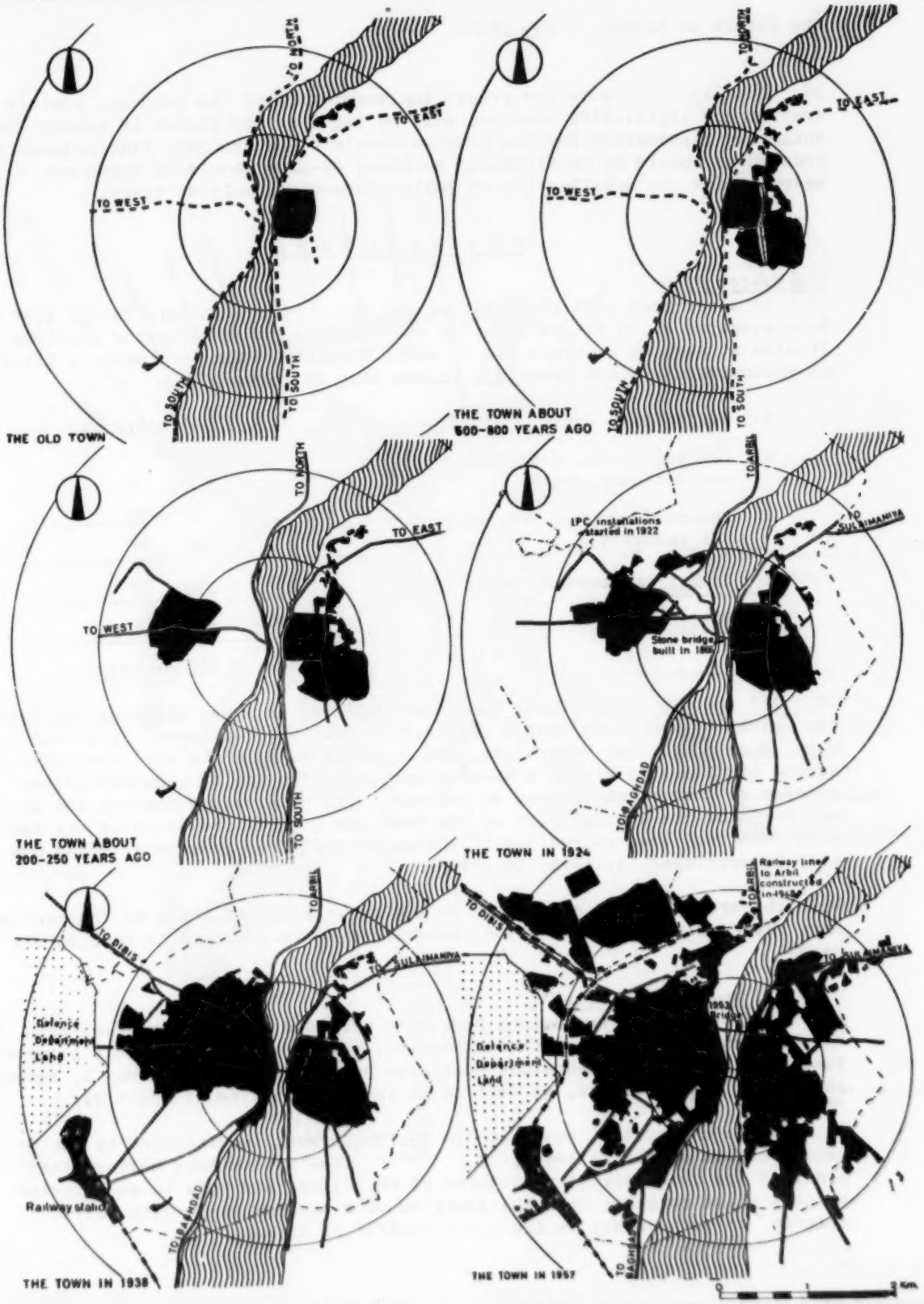
56. On the basic principle that there should be an interrelationship between family income and the cost, and consequently the size, of the house of each family, and on the assumptions that residential plots will range between 144 sq.m. and 450 sq.m., that the future family will consist of 5 persons and that 1.44 families will correspond to each plot, the total gross residential area of the future town, that is the total plot area plus allowance for roads, community buildings, local markets etc., will amount to about 1,900 hectares.

General Policy

57. The multiformity of the problem existing in the present town necessitate the implementation of several types of programs for its future development. There should be separate programs for the development of complete and integrated new residential communities, programs for the amelioration of communities which may be ameliorated, programs for general community facilities, programs for community buildings, programs for the development of the central civic, commercial and business areas, programs for the creation of industrial estates for the attraction and functional grouping of industries etc.

* 1 ID = $2.80

THE GROWTH OF KIRKUK



DOXIADIS ASSOCIATES - CONSULTING ENGINEERS

The future of Kirkuk, Iraq, 1958. --10

58. Finally, to ensure the proper implementation of the program, administrative and legislative measures will be required and should be taken. The authority responsible for the program should be determined; land acquisition procedures should be facilitated; building by-laws should be drawn up; measures for the mobilization of public interest should be taken.

THE PROGRAMS

The Master Plan

59. In accordance with the policies set out, the preliminary Master Plan has been prepared in an effort to solve the existing and anticipated problems. It aims at serving a population of about 250,000 people and covers a total area of approximately 5,100 hectares, broken down as follows:

a.	Residential areas	2,000 hectares
b.	Central civic, commercial and business areas	500 "
c.	Industrial zones, excluding oil industry	500 "
d.	Parks, cemeteries, major roads	1,250 "
e.	Military installations	850 "
	Total	5,100 hectares

60. All the new developments have been designed in a way allowing for further expansions of the town, beyond the targets set by the program, in a functional way. Such additional expansions, which may be found to be necessary during a second big phase of Kirkuk's development, or which may be required earlier because of factors unforeseen at present, will be provided towards the South and North of the Western part of the town and towards the South of its Eastern part. In that case expansions of the major and minor industrial zones may also be developed, as shown in the plan.

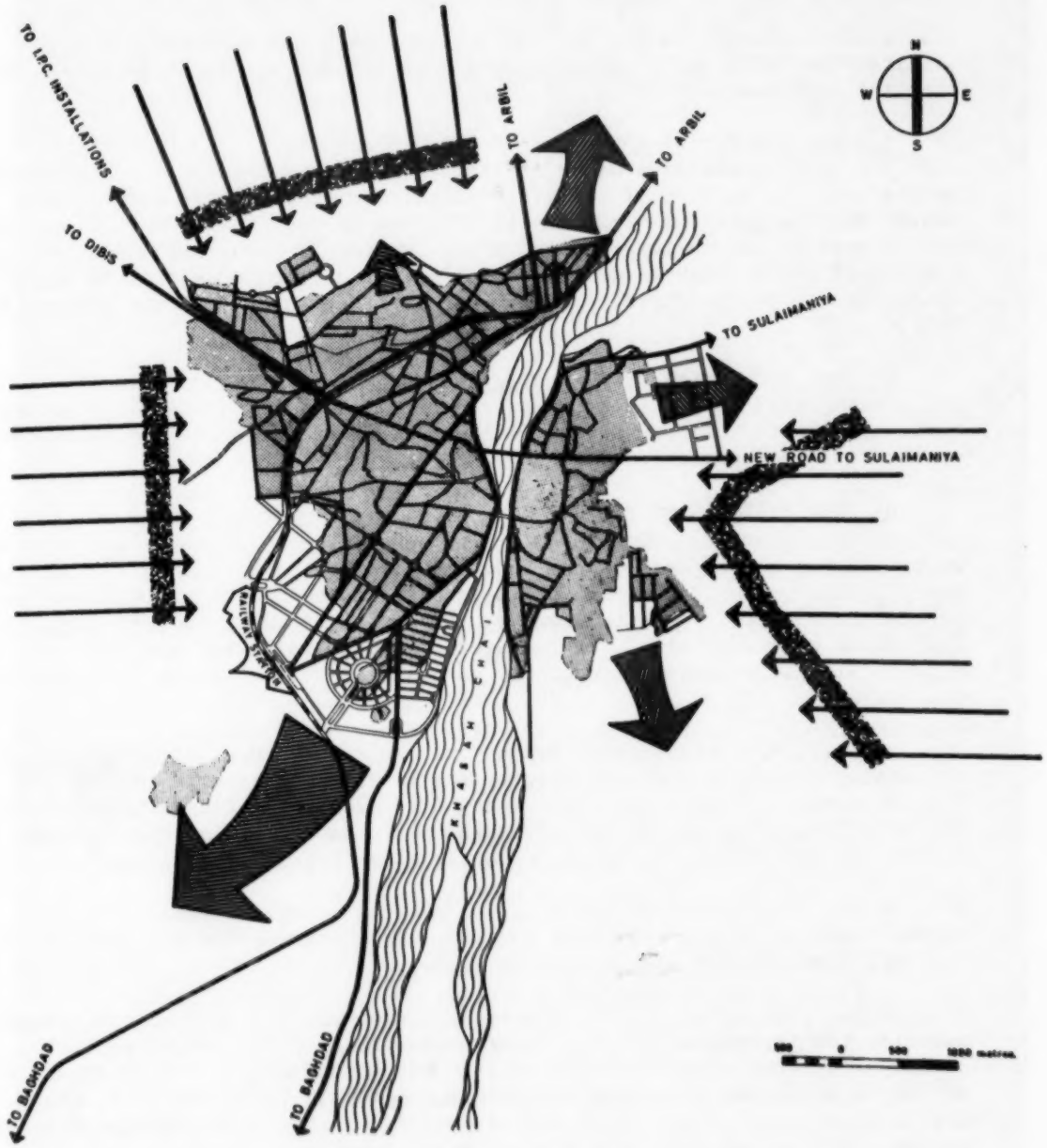
61. The area occupied at present by the army is not affected by the preliminary Master Plan. Its expansion, nevertheless, is provided to meet future needs.

a. New Housing Areas

62. Most of the new expansions have been provided SW of the present town, on the Western side of Khasah Chai. However, and in order to properly balance future developments, expansions have also been provided to the North, towards the I.P.C. installations, as well as on the Eastern side of the river.

63. As stated earlier, expansion to the South West is disturbed by the present location of the railway line. The preliminary Master Plan provides for the eventual relocation of this line, and this is anticipated to take place together with the erection of a new and up-to-date railway station, so much needed by the heavy traffic of Kirkuk.

TRENDS FOR THE PHYSICAL EXPANSION OF KIRKUK



64. During the second and major phase of Kirkuk's development considerable expansions of the residential areas may also be provided between the army installations and the airport, along the road to Dibis. Such expansions will mainly cover the housing needs of the industrial development which is anticipated to take place towards that direction.

65. Within each of the residential sectors the program provides for the simultaneous building of adequate local schools and religious buildings to meet the legitimate needs of the inhabitants.

b. New Industrial Zone

66. The development of a major industrial estate is foreseen to take place on the areas lying West of the proposed railway line. These are the best areas from the point of view of prevailing winds and, furthermore, they are well served by the railway and are close to areas where housing schemes for industrial workers may be developed. Minor areas for industrial establishments, mostly for handicrafts, have been provided in the Eastern part of the town.

c. New Commercial and Civic Buildings

67. Considerable expansions of the central area to serve the continuously increasing civic, commercial and business needs of the town have been provided on both sides of Khasah Chai.

d. New Public Open Spaces

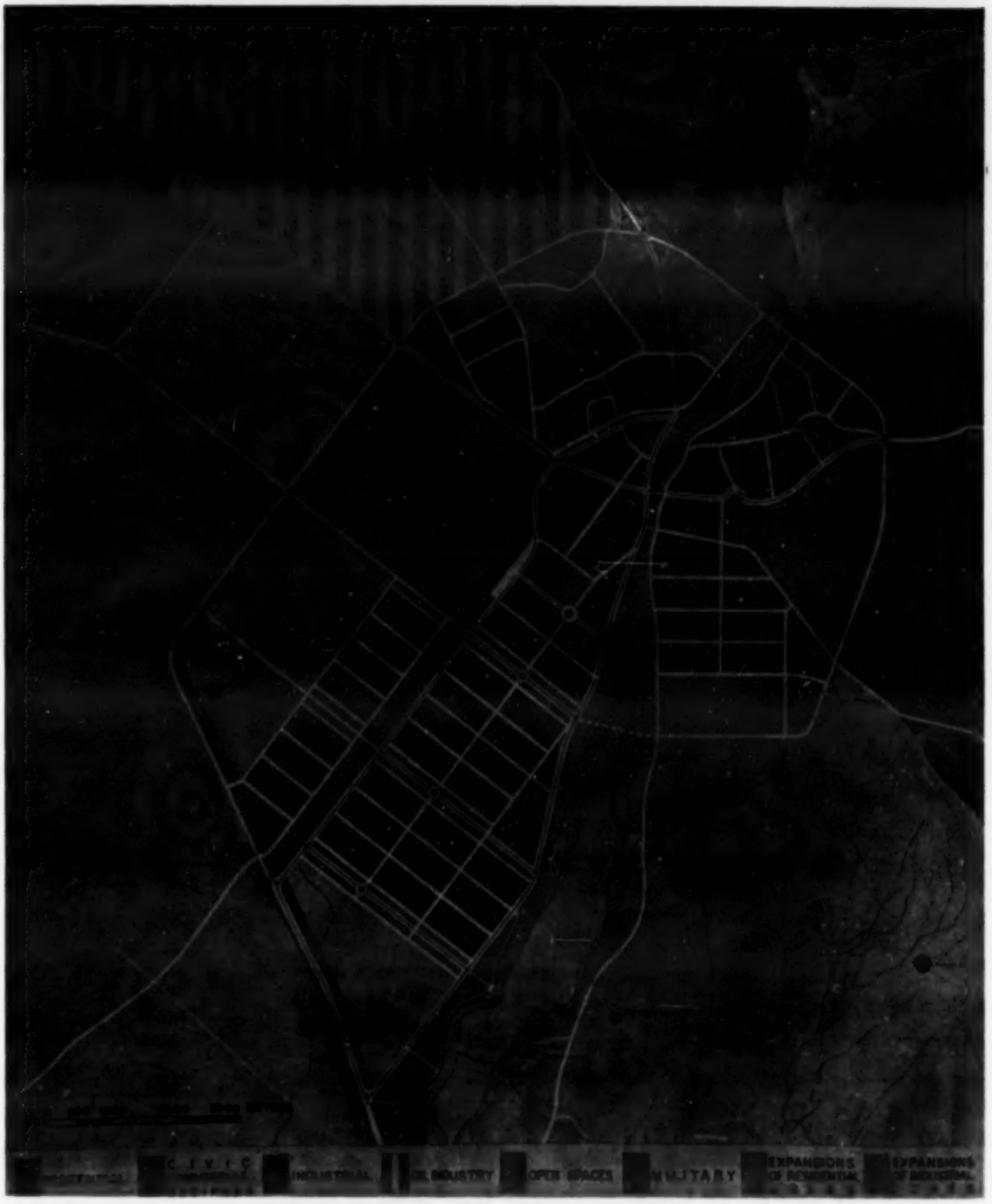
68. Al Qala quarter, which is the most densely built district, and has the worst housing conditions, of the town, is proposed to be turned into an open space by the gradual transfer of its inhabitants to new and integrated residential communities. Special measures should be taken by the Government to facilitate this operation. It is understood that religious and other buildings in Al Qala presenting aesthetic or historic value will be preserved and maintained.

69. Several green spaces are proposed within the residential areas and along the Chai. The development of major parks is also foreseen in the Eastern Town in connection with the expansions of cemeteries. Several higher order community buildings may be accommodated within many of these open spaces, especially for sports and other recreational and social activities.

70. During the first five years of the program's implementation the most urgent needs of Kirkuk should be covered. Furthermore, the foundations of the long-term program should also be laid.

71 During this first period of action, therefore, the main effort should be made for the improvement of the housing conditions of the families living in houses of unacceptable standards and, on the other hand, for the commencement of the construction of a complete sewerage system. It is estimated that during this period about 3,000 houses should be built by Government initiative, besides those which will be erected through private initiative.

PRELIMINARY MASTER PLAN OF KIRKUK



DOXIADIS ASSOCIATES - CONSULTING ENGINEERS

The future of Kirkuk, Iraq, 1958. --11

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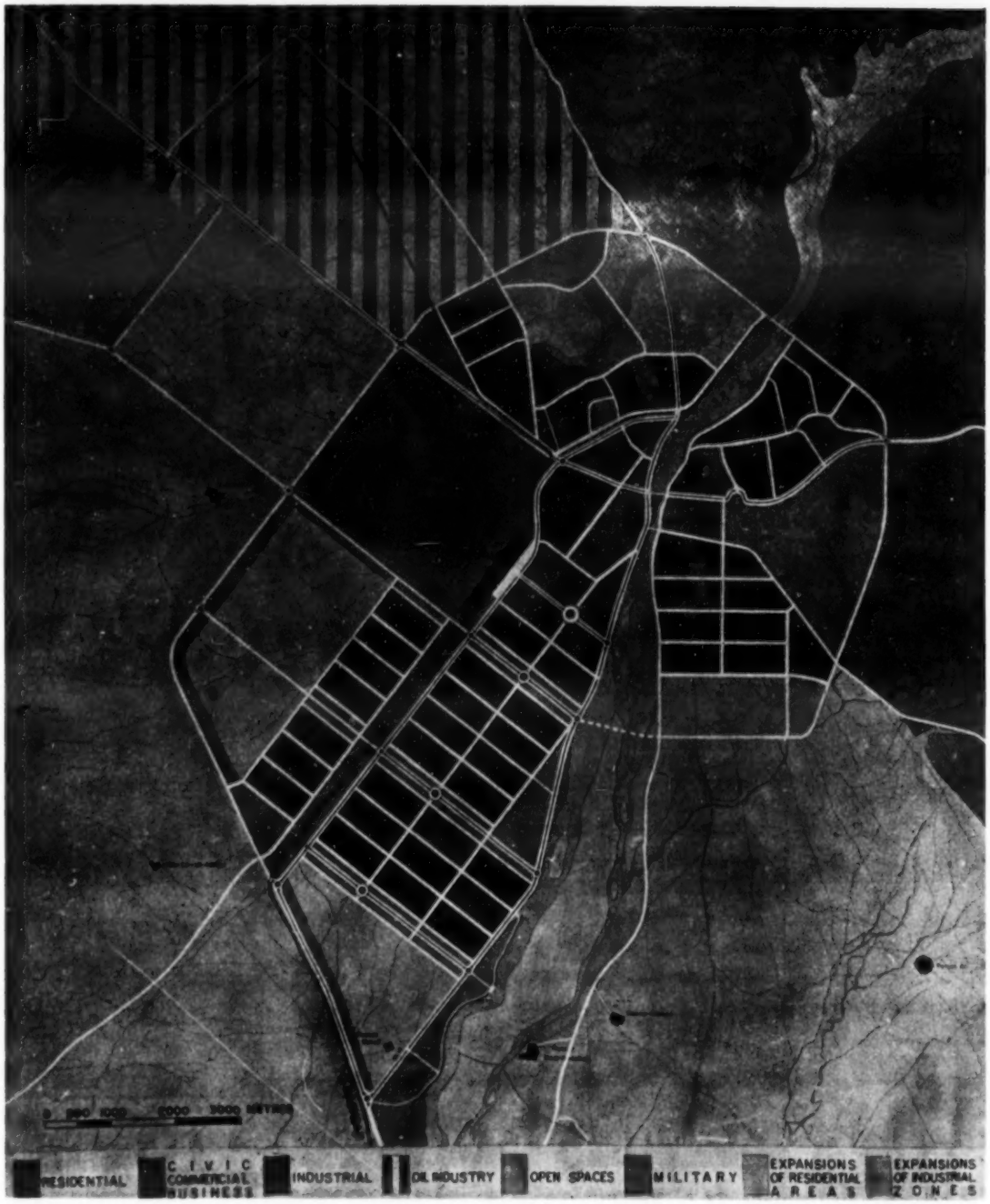

The future of Kirkuk, Iraq, 1958. --12

72. In addition to these two types of projects, that is, the construction of new houses and the construction of sewers, the Government should also initiate the program for the amelioration of the housing conditions in those districts which, according to the detailed plans, will need amelioration. Furthermore, a considerable number of residential plots should also be developed in order to guide private initiative and attract houses which will be built throughout the city in organized and integrated communities.

Costs

73. The approximate total estimate of cost for Kirkuk's development during the period covered by the long-term program, that is during the period of about one generation, amounts to:

a.	New residential communities	ID	53.0 million
b.	Community buildings for (a)	"	11.0 "
c.	Amelioration of 2,800 houses	"	0.7 "
d.	Major community facilities	"	11.3 "
e.	Central area	"	16.0 "
f.	Land acquisition	"	12.0 "
	Total	ID	104.0 million

74. The cost of the first 5-year program is estimated to amount roughly to:

a.	Government initiative:				
	i. New housing communities for 3,000 houses, complete with community facilities	ID	4.5 million		
	ii. Development of plots for another 3,000 houses	"	1.0 "		
	iii. Amelioration of the housing conditions of 1,500 houses	"	0.4 "		
	iv. General community facilities, mainly sewers	"	2.0 "		
	v. Land acquisition	"	1.1 "	ID	9.0 million
b.	Private initiative: Construction of 3,000 houses	ID	4.0 million	"	4.0 million
	Grand total			ID	13.0 million

Financing

75. The sum of ID 9,000,000 which whould be allocated through Government funds during the first five years of the implementation of the ekistic program for the development of Kirkuk, requires indeed a considerable effort on behalf of the Government. Nevertheless, the exceptional importance of Kirkuk for Iraq

should be borne in mind as also the fact that about 5,500 houses in it are unsuitable for living and require either immediate replacement or amelioration.

76. The Government, in accordance with its general policies, will define the exact amount which will be allocated for the first 5-year program of Kirkuk's development, and on the basis of these allocations this program will then be finally drafted. It may only be said that the bigger these allocations are the faster the urgent needs will be met. Furthermore, sounder foundations will be laid for the realization of the long-term program and more land will be acquired at reasonable prices, a matter which will ensure future development.

E K I S T I C S

HOUSING & PLANNING ABSTRACTS

CLASSIFICATION SYSTEM USED BY DOXIADIS ASSOCIATES

A The Problems

B The Policies

C The Programs

D People, Development, and Ekistics**
- Geographic factors
- Social factors
- Industry
- Agriculture
- Transportation

E Houses

F Structures
(Exclusive of Houses)

G Community services
- Utilities and Social Services

H Regions

I Major urban centers

J Market towns
- Medium-sized and small towns
- New towns

K Villages
- Rural land

L Farms

M Surveys
- Census data
- Topographical surveys

N Research
(and Technical Education)

O Planning
(and Landscaping)

P Financing

Q Urban land

R Labor

S Materials

T Construction
- Systems of Building and Costs

U Implementation

V Management

W Administration

X Legislation

**Refers to centers of activities in relation to their surrounding regions.